

FLIGHT

The
AIRCRAFT
ENGINEER
&
AIRSHIPS

First Aero Weekly in the World

Founder and Editor: STANLEY SPOONER

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DIARY OF FORTHCOMING EVENTS.

Club Secretaries and others desirous of announcing the date of important fixtures are invited to send particulars for inclusion in the following list:

- Feb. 28 ... Lecture by Mr. Handley Page, C.B.E., at King's College, Strand, at 11 a.m.
- Feb. 29 ... Closing Date for Hydro-aeroplane Competitions at Monaco, April 18 to May 2.
- April 7 ... Lecture by Mr. J. L. Cope, "Aerial Survey in the Antarctic," at Central Hall, Westminster, 8 p.m.
- April 18 to May 2 ... Seaplane Competition at Monaco
- May 22 and 23 ... Aviation Competition at Juvisy in connection with Fêtes de Paris
- June 1 ... Air Ministry Competition (Small Type Aeroplanes), Martlesham Heath
- July ... S.B.A.C. International Aero Exhibition at Olympia
- July (mid.) ... Seaplane Contests at Antwerp
- Aug. 1 ... Air Ministry Competition (Seaplanes) Felixstowe
- Aug. (end of) ... Schneider International Race, Venice.
- Sept. 1 ... Air Ministry Competition (Large Type Aeroplanes), Martlesham Heath
- Sept. (end of) ... Gordon-Bennett Aviation Cup, France.

EDITORIAL COMMENT



THE *Daily Mail* last week caused something like consternation by the form in which it set forth its announcement of the new scheme of commands in the R.A.F. Read in conjunction with the headlines, it conveyed the impression to the ordinary reader that it had been determined by the Government to revert to the old scheme of organisation and to revive the Naval and Military Wings. In a word, that the separate Air Service, which was the outcome of the lessons of nearly four years of war, was to be scrapped and we were to go back to the conditions obtaining prior to 1918. For our own part, we did not take the matter seriously, inasmuch as we have known for many months that a drastic revision of areas and commands was to take place, and that only the details remained to be settled. That has now been done, and in future the R.A.F. will be divided for purposes of command into two main areas, viz., Military and Coastal, the former taking in all formations working with the Army, while the latter will deal with units attached to or destined to work with the Navy. It is understood that Air Vice-Marshal Sir J. M. Salmond will command the Military Area and Air Vice-Marshal Vyvyan will take over the Coastal Area.

Included in the new scheme of organisation will be the Cadet College at Cranwell, which at present is under the command of Air Commodore Longcroft, and the training school for boys at Halton Camp, Wendover. It will be gathered that nothing in the new organisation affects the status of the R.A.F. as an independent service, though it is a matter of great regret that economy seems to have been a greater consideration than the efficiency of our aerial defences. The Department of the Inspector-General has been disbanded, and nothing has been put in its place, though it is understood that Sir Godfrey Paine has been offered another appointment at the Air Ministry.

No
R.A.F.
Territorials?

Again on the score of economy, the idea of forming a Territorial branch of the R.A.F. has been hung up for the time being. It is "still being investigated and . . . some time must be allowed for the

framing of a scheme to meet the necessary conditions." The matter is one of urgency and we trust this does not mean that the question has been shelved indefinitely. There is not an authority who does not agree that the decision of the next great war will be made in the air. We have been warned over and over again by our greatest soldiers and sailors that victory will lie with the Power which is able to strike the first and heaviest blow from the air. We have been told that if we are to sleep easily in our beds it is essential that we shall be the Power which is capable of striking that blow—not that we want to possess that power for the purposes of aggression but in order that we may be secure against attack and in a position to take the lion's share in preserving the peace of the world. There is only one way in which we can secure that lead in air power and that is by the maintenance of a comparatively small but highly efficient active air force, backed by the necessary reserves to expand it to a war footing at the first warning of probable hostile action. There is an alternative in the shape of a huge active air force, ready for war at all times, but that is obviously out of the question on the score of the enormous expense it would entail.

Where is that reserve to be found if the Territorial idea is dropped? Some say from the pilots, observers, and staff employed in civil aviation. Well, whatever happens there will always be some of these so engaged, but as the Government has no policy in relation to civil aviation it does not look at the moment to be a very hopeful field for the proper expansion of the fighting air force in time of need. Moreover, if we are to obtain our reserves from among the civilian staffs it means that these must be subjected to periodical training, since the war pilot cannot be made in a day after war has burst upon us. That is to say, the selected pilots, observers, mechanics and all the rest who will be required in case of war must first of all be embodied in some organisation, Territorial or Special Reserve, in order that the Air Ministry may have the call upon their services when needed. What is the intention?

The memory of the politician is truly a short one. Does this Government of shreds and patches not recollect that in the years before 1914 the shibboleth of successive administrations was that blessed word "Economy"? Does it not also recollect that the Army was kept on a mere police footing and that no statesman had the courage to go to the country and say that Lord Roberts was right and that every man must do his duty to the State and train himself for its defence? And, has it passed out of memory that even the Navy was starved, so that when the War broke out there was not a defended war harbour on the East Coast and that the Grand Fleet was so short of destroyers and light cruisers that, had the Hun been as good a sailor as he was a soldier, literally anything might have happened in the first few months of hostilities? Do any of our "statesmen" believe that if we had been in a position to have landed a million men in France, in place of the 180,000 we were actually able to send to the assistance of our Allies, Germany would have ever taken the risk of war at all? To bring the matter to its logical conclusion, the War was the direct result of the policy of economy—and a most economical result it was! A million good British lives and £8,000,000,000 of British treasure is a fairly heavy price to pay for "economy." Yet it is the same sort of economy to which the country is

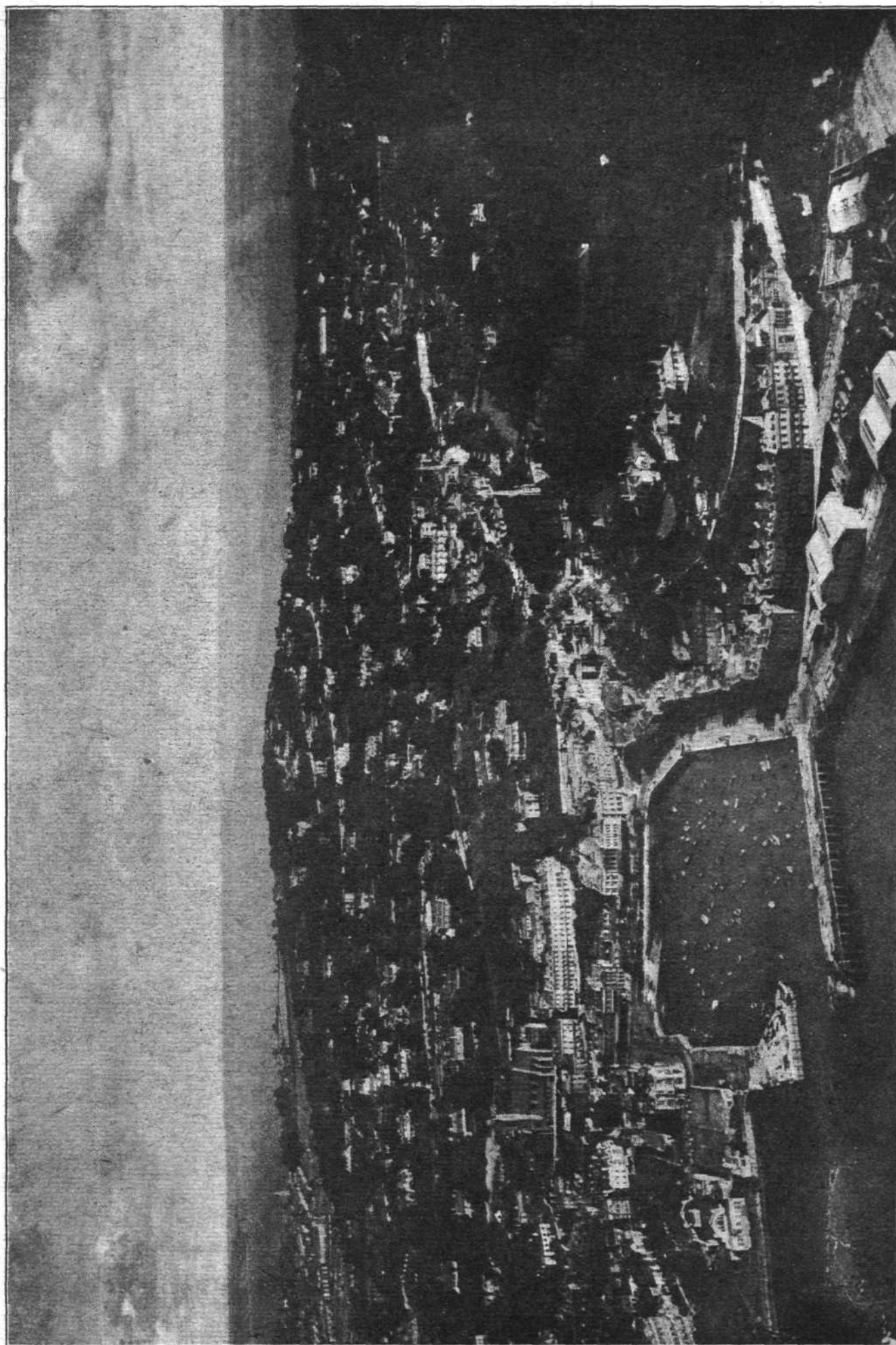
being asked to subscribe now, and not the best aspect is that it is in relation to the very Service which by common consent will be called upon to open hostilities in the event of another war. The present Army estimates are roughly three times as large as the heaviest of the pre-War estimates, while those for the R.A.F. are to be cut down almost to vanishing point. Really, it all passes the comprehension of the plain citizen, who is simply bewildered at what is taking place.

The First Decisive Air War

The short, sharp campaign which has just ended in Somaliland may quite justifiably be described as the first decisive war in the air, or, rather, the first in which air power has been the principal and deciding factor. For nearly twenty years the "Mad Mullah" has been a thorn in the side of British administration in the Protectorate. Often defeated by the British forces operating in Somaliland, the Mullah has nevertheless more often countered by a blow which has not seldom been disastrous and always humiliating to British prestige. The difficulties consequent on conducting a campaign in the wild country behind the coast were, in 1909, judged to be insurmountable and the grave decision was taken to abandon the *hinterland* to the Mullah and his followers and confine our administration to the coast towns. During the succeeding four years the bloodthirsty rule of the Mullah had become so intolerable that a policy of reoccupation was decided upon in 1913, but one of the first results of this was the signal defeat of the Somaliland Camel Corps at the hands of the Dervishes. A new campaign was in course of preparation when the Great War broke out and postponed the operations which have now been so completely successful, thanks to the co-operation of air power.

During the period of the War the Mullah was in occupation of about half of British Somaliland, and under his rule the peaceful inhabitants endured "untold suffering." Once the War was over, it was decided to finally and definitely break the power of this troublesome fanatic and his followers. The campaign was opened on January 21 and in less than three weeks the power under which the country had groaned for two decades was, the Government assures us, "entirely destroyed," the Mullah having "lost the whole of his force, all his stock and all his belongings." He himself escaped with his life, but he is being hunted through the desert and whether he ultimately be captured or killed or not it is reasonable to believe that his power for evil has gone for ever. The cause of his swift downfall was the employment of air power in the shape of a single unit of the R.A.F., under the command of Group-Captain Gordon, D.S.O. In the words of the official record of the campaign, this unit, co-operating with a comparatively small number of native and Indian troops, has secured this remarkable result "with practically no casualties and with a minimum of expenditure." As Col. Amery pointed out in the House, when announcing the victorious termination of the campaign, this is the "first time that the aeroplane has been deliberately employed as the primary striking instrument, and not merely as an auxiliary weapon." And it was all done at a cost of £30,000 against an estimated figure of 2½ millions before the War, or 6 to 7 millions now, had the campaign been conducted on the older plan without the co-operation of air

The Camera and the 'Plane



Torquay, as seen from an Avro seaplane

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power. Really, comment would indeed be superfluous.

The campaign will be historic, for the reason given by Col. Amery. It may be recalled that when, in the early part of 1914, the operations against the Mullah were in contemplation it was the intention to use an airship of the Parseval type. How much could have been accomplished by such a craft is purely a matter of speculation now, but it is certain that nothing approaching the swift decisiveness of the attack by low flying aeroplanes so well described by the Under-Secretary for the Colonies could have been achieved. Certainly the part played by aircraft in this campaign supplies an effective answer to the critics who argue that aircraft can never undertake the independent strategic rôle in war, but must always play the part of auxiliaries to armies or fleets. Here—on a small scale, it is true—we have a most illuminating example of troops actually being auxiliaries to aircraft, the latter playing the leading part all through. It may be remarked that the affair was carried through by a single battalion of the King's African Rifles, with a detachment from an Indian infantry battalion, assisted by the Somaliland Camel Corps—a force of about 2,000 men. The aircraft did all the reconnaissance, located the enemy, attacked, defeated and dispersed his forces—and then the infantry came up and occupied the positions he had left. A more complete answer to the aforesaid critics it would be quite impossible to imagine. It is certainly one that should make them revise all their preconceived ideas of the status of the aerial arm in war.

Not only in Somaliland has the aeroplane proved that it can be an absolutely decisive factor in war. On the Indian frontier it has played an almost similar rôle, except that the results have not been so swift or as impressive. The Mahsuds, one of the most troublesome tribes on the frontier, have been so terrorised by repeated aerial attacks that they have sent in to say they have had enough and do not mean to wait until the ground troops come along to complete the work so well begun by aircraft. There is no need to stress the moral, which must be plain to be read by all who take the trouble to think at all, and we need only express the hope that it will impel the Government to revise its present policy—or want of policy—in relation to Imperial defence. It must

realise now that war is in very truth an affair of three dimensions and not of two as in times gone by.

The R.A.F. and Overseas Garrisons

In his speech on the Army Estimates, Mr. Churchill informed the House of Commons that he was asking for competitive tenders from the Army and the R.A.F. for the garrisoning of Mesopotamia. Up to the present, he said, the General Staff has not been able to offer any solution of the problem, except by the employment of a military garrison, the cost of which would crush the country. It may be, he continued, that by changing the point of view and by applying an entirely new line of thought, a great saving in annual expenditure may be effected, and that a practical scheme involving a real reduction may be framed on high professional authority, and should it receive the approval of the Cabinet, the Air Force Estimates will be increased by the amount necessary to provide for the internal security of Mesopotamia. It will also follow that the Command-in-Chief in Mesopotamia will be vested in an officer of the Air Force, just as in other parts of the Empire for practical purposes the air forces are placed under the command of the local military Commander-in-Chief.

The matter has not been settled yet. It is undergoing examination by the War Office and the Air Ministry, and the ultimate decision rests on the amount of economy resulting from the change and the degree of reliance which can be placed on aerial methods of control. It is not for us to prejudge the issue of these deliberations, but the impressiveness of Mr. Churchill's utterances lies in the fact that this is the first occasion in all history on which it has been seriously proposed to place the military control of a great conquered area in the hands of the aerial arm. It is truly a case of air power coming into its own and being regarded for the first time in its proper perspective. Indeed, whether or not the Air Force is entrusted with the garrisoning of Mesopotamia, it has been paid a very high compliment by the Government, and the full consideration of its claims is indicative of a complete change of vision on the part of the high authorities who are responsible for the defence of the Empire.

The Future of the R.A.F.

THE Secretary of the Air Ministry communicates the following:—

"The statement which has appeared in the Press to the effect that the Royal Air Force is being split up is without foundation. The new Air Force Area Commands in this country are not meant in any way to break up the Force. The policy is simply one of reducing the number of Area Commands, and it has been adopted solely in the interests of efficiency and economy, and to fit in with the general organisation of the Air Service thought suitable by the Air Staff. The policy was outlined in the memorandum by the Chief of the Air Staff laid before Parliament in the White Paper No. Cmd. 467 and published in the Press on December 15 last, and there has been no change whatever in the policy.

"The question of a Territorial Air Force is still being investigated by the Air Ministry, and, in view of the difficulties, some time must be allowed for the framing and evolution of a scheme to meet the necessary conditions."

Civil Flying in India

THE Air Ministry makes the following announcement:—
"Regulations governing civil flying in India, to be known as Indian Aircraft Rules, 1920, were promulgated on January 31, from which date civil flying in India would be permitted."

R.A.F. Medical Branch

THE Air Ministry makes the following announcement:—
"Revised rates of pay for airmen of the Medical Branch of the Royal Air Force have now been approved with effect from August 1, 1919. These rates range from 16s. per day for a Serjeant-Major 1st class, to 4s. for aircraftmen class 2, and 1s. 6d. per day for boys. The rates are to be regarded as covering all duties which men of the Medical Branch may be called on to perform."

Free Discharge or Transfer to Reserve of Airmen

THE Air Ministry makes the following announcement:—
"With the object of reducing the present *personnel* of the Royal Air Force, it has been decided to grant a number of free discharges or immediate transfers to the Reserve among certain classes of airmen serving in Home areas. For the present this privilege will only be extended to certain warrant officers, non-commissioned officers, and airmen whose engagement or period of Colour service will expire prior to March 31, 1921. Airmen who extended their service for short periods since the Armistice are eligible only for free discharge and not for transfer to the Reserve.

"Warrant officers, non-commissioned officers and airmen electing to take their free discharge under this offer will receive only the full amount of bounty (if any) due to them up to the date of their discharge."

REPORT ON THE JUNKER ARMoured TWO-SEATER BIPLANE, TYPE J.1*

Two machines have been examined, one of which was salvaged by British troops near La Vacquerie, during the German retreat. The other was brought down by the French. Armour-piercing bullets fired from a ground machine gun penetrated the armour and caused the descent of the machine. As the data upon which this report is based were collected

Engine.—230 h.p. Benz.
Crew.—Two, pilot and observer-gunner.
Petrol capacity.—26 gallons.
Oil capacity.—10 gallons.
Weight per horse-power.—19.9 lbs.
Loading per square foot.—8.56 lbs.



Fig. 1.

from the debris of these two examples, both of which were entirely dismantled and greatly damaged, there are points upon which a certain amount of uncertainty must exist. The utmost care has been taken, however, in the reconstruction of the machine, and doubtful points are specified.

General

The Junker is radically different from the usual type of aeroplane, whether considered from the point of view of design or of actual construction.

It is evidently a serious attempt to reduce to a minimum the dangers due to enemy action while in flight, and to lengthen the life and endurance of the machine in spite of exposure to bad weather and to rough handling. To this end the machine is armoured, and all vulnerable units, so far as possible, are gathered within the armoured portion. Inflammable materials, and those which suffer rapid deterioration when exposed to rough weather, are almost eliminated. Tension bracing by means of wire cable is entirely absent, rigidity in planes, fuselage and undercarriage being obtained in all cases by metal tubes. Even the aileron control is without wiring, and careful search has failed to reveal any constructional wiring, save that of the elevator and rudder controls.

No information is to hand regarding performance, but it is known that the machine requires an exceptionally long run before getting off.

Dimensions (See scale drawings):—

	sq. ft.
Area of upper centre section	134.7
Area of each upper plane (with aileron) ..	125.8
Area of complete upper wing (with ailerons)	386.3
Area of each aileron	32.0
Area of balance of aileron	2.4
Area of lower centre section	48.0
Area of each lower plane	49.6
Area of complete lower wing	147.2
Area of total wing surface	533.5
Horizontal area of fuselage	52.1
Vertical area of fuselage	76.0
Area of fin	12.0
Area of rudder	15.4
Area of balance of rudder	1.6
Area of fixed tail planes (both sides) ..	49.0
Area of elevators (both)	33.6

Wings

General design.—The upper plane has a large centre section (rectangular except for the cut-away portion over the pilot's head), which is strongly braced to the fuselage by means of a system of steel tube struts. The leading edges of the upper planes are set back at an angle of approximately 5° from

Fig. 2.—Junker section. Note.—The Fokker section is shown dotted



General Particulars and Dimensions

Weights.—(See table at end of report.) Figures painted on fuselage give:—

	lbs.
Weight, empty	3,724
Useful weight	845
Total weight	4,569

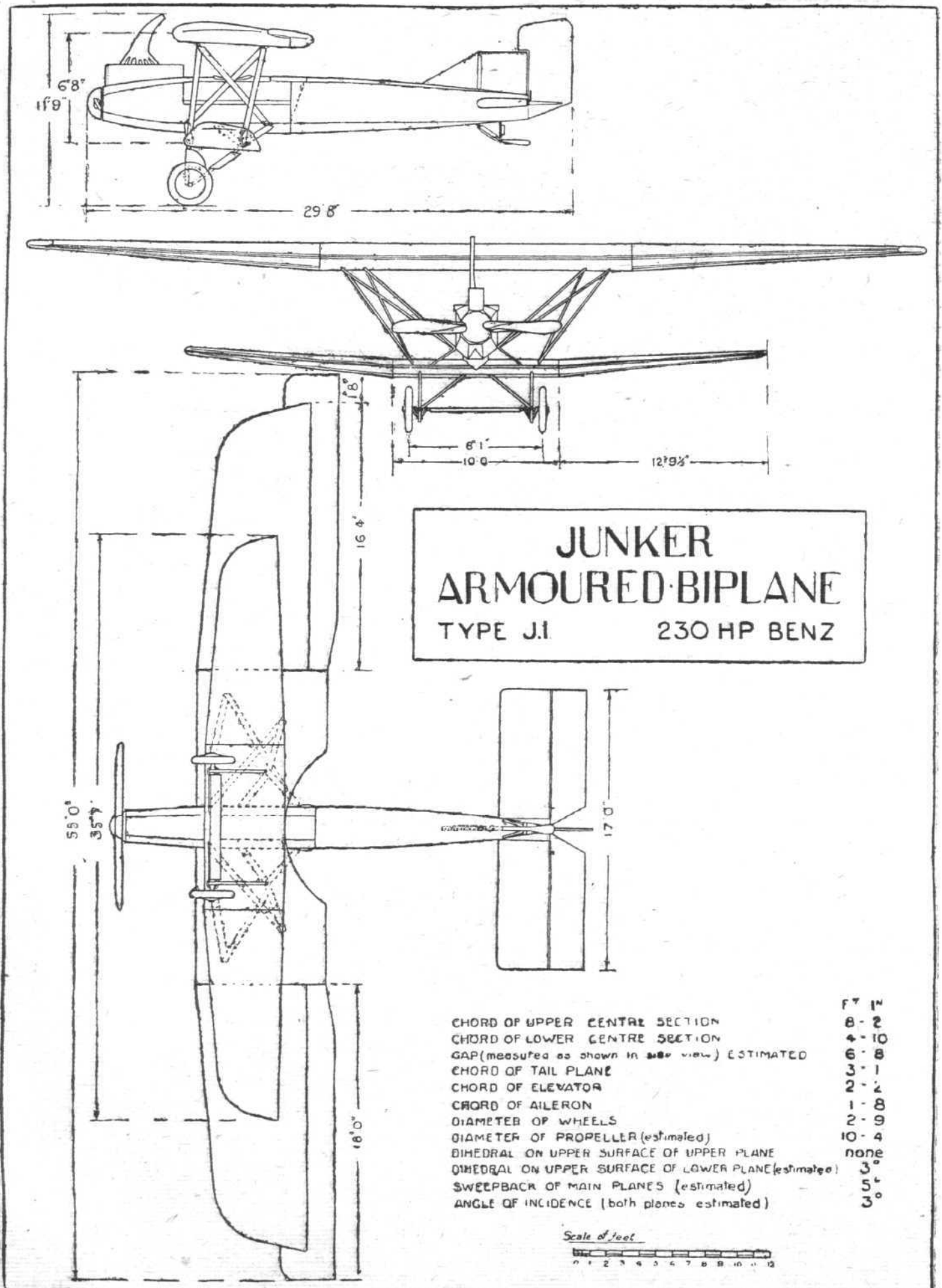
* Issued by Directorate of Research, Air Ministry.

the line of the centre section leading edge, but the trailing edges are at right angles to the line of flight for by far the greater part of their length.

The lower planes follow more or less the same plan, but the lower centre section is very much smaller than the upper, and is built up in one unit with the undercarriage. To this unit the fuselage is firmly fixed by short steel tube struts, and an aluminium fairing is built around that part of the fuselage which is adjacent to the centre section's upper surface.

There are apparently two attachments which directly couple the fuselage to the centre section unit. These take the form of lugs fitted to the two bottom edges of the octagonal body, midway between the forward pair of strut attachments. The lugs are bolted to corresponding lugs welded on to steel sleeves, which are in turn riveted to two upper duralumin

spars of the lower centre section. The aluminium cowl which bridges the gap between body and lower centre section is simply a fairing. To each side of the lower centre section is fixed a side plane, which tapers in plan view from both front and rear towards the tips. Reference to the plan view given in the scale drawing will make these points clear.



The damaged condition of the machines under examination has prevented absolute certainty on the question of dihedral, but there are excellent grounds for believing that the front view of the machine approximates very closely to the true disposition of the planes. It will be seen on reference to this view that the upper surface of the upper wings is horizontal as in the D 7 Fokker, and on this point there is hardly any doubt. There is undoubtedly a dihedral on the lower planes, but the exact angle of dihedral is a matter of estimation. The angle given in the drawings, viz., 3° , is probably very near the truth. It will also be noticed from the scale drawings that the angle of incidence has been estimated at 3° for both upper and lower planes.

The planes are based on the Fokker principle, i.e., they are made sufficiently strong to obviate the necessity for external wire bracing.

The port and starboard planes, both upper and lower depend entirely for their support upon the spar joints.

Wing Section

Sections drawn to scale are shown in Figs. 3 and 3A, and Fig. 2 gives a comparison between the Junker J.I. and Fokker D. VII aerofoil sections. There is a good deal of similarity between the two, but it must be remembered that the Junker wings are set at an appreciable angle of incidence, whereas the Fokker planes are without incidence.

Wing Construction

It is in this particular that the greatest departure from established practice is found. The planes are constructed entirely of metal, even to the covering. A description of the constructional features of one of the upper planes will explain the system upon which the wings are built.

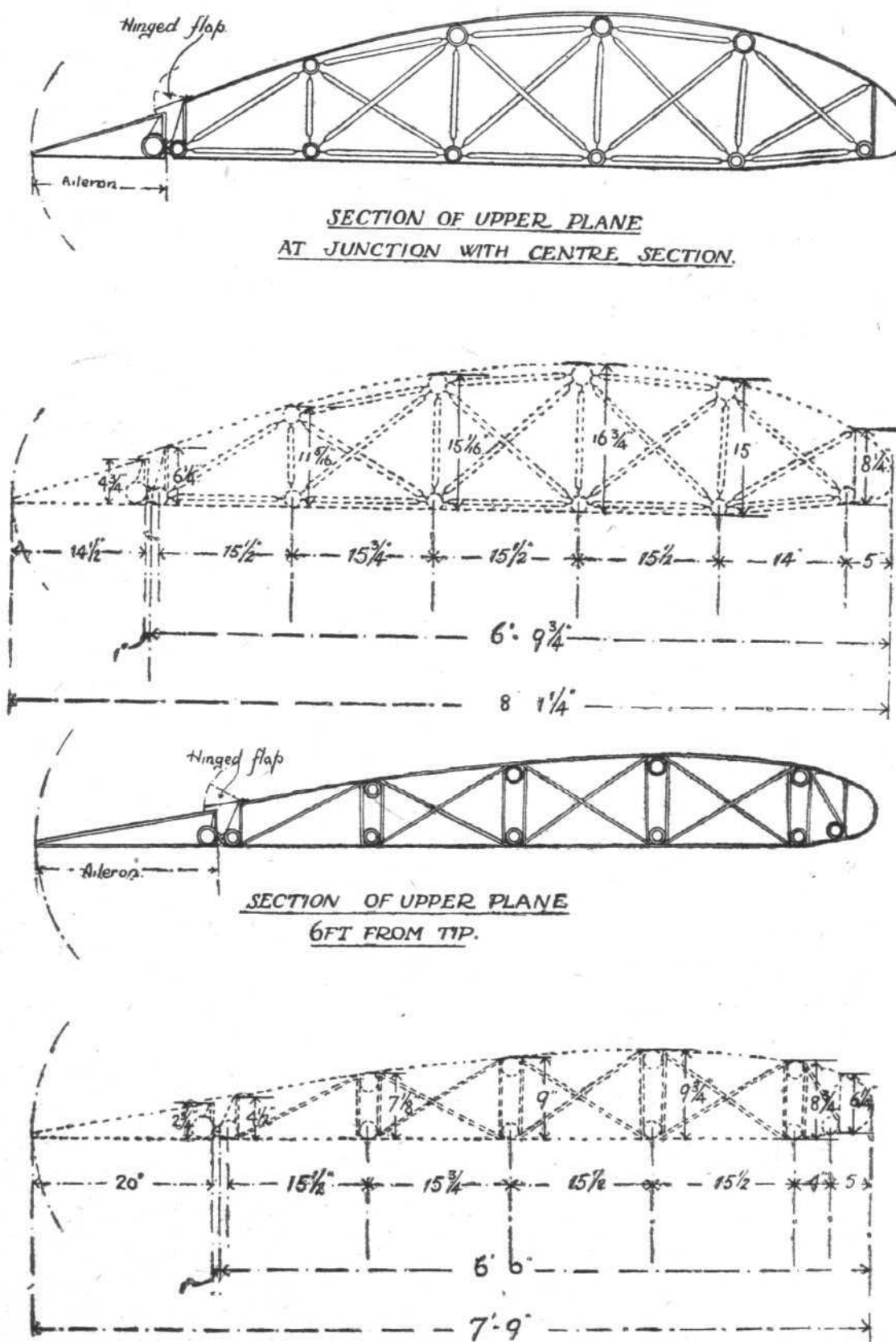


Fig. 3.—Sections to scale of Junker upper wing

Each upper plane contains 10 spars of duralumin tube, without counting the aileron tube. Fig. 3 gives a section drawn to scale, showing the disposition of these spars, and the lower half of the diagram gives all dimensions, including

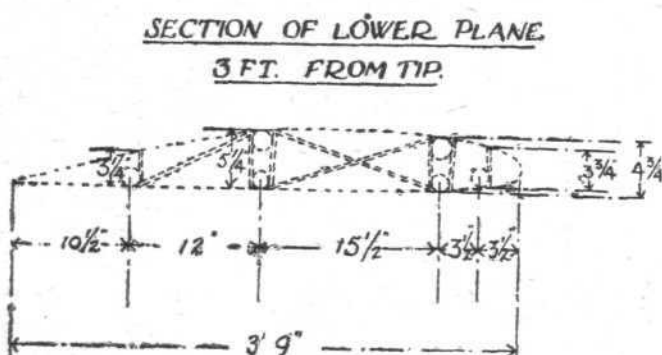
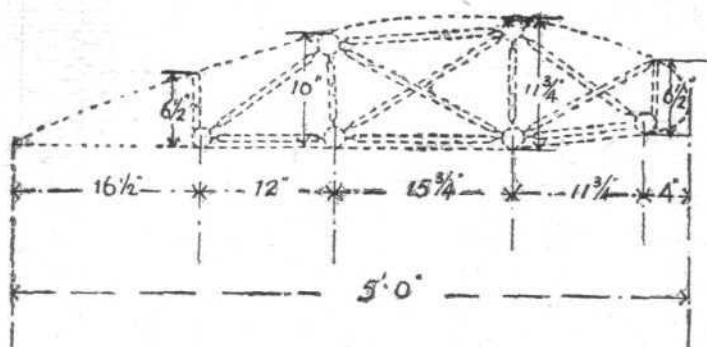
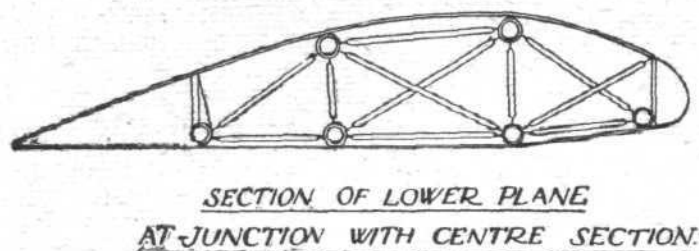


Fig. 3a.—Sections to scale of Junker lower wing

the diameters and gauges of the tubes. The tubular spars are braced to each other by means of smaller tubes, also of duralumin. The exact system employed is shown very clearly

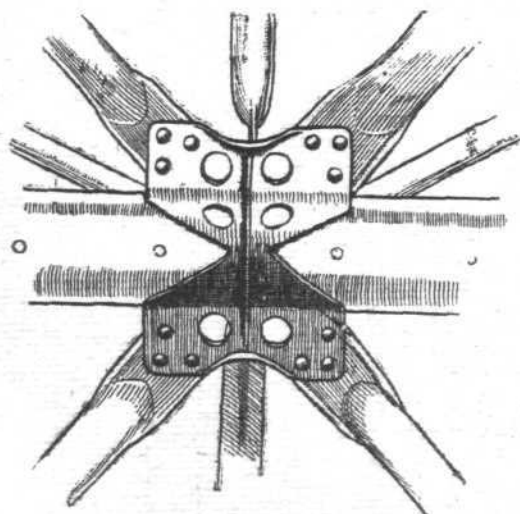


Fig. 4.

in the photograph (Fig. 7) and the sketch (Fig. 8 (1 and 2)). It will be noticed that steel sleeves are riveted at intervals along the spars, and that the bracing tubes are flattened out at the ends and riveted to small flat plates welded on to the

steel collars. Examples of these joints are given in Figs. 4, 5 and 8.

The constructional methods already described as being found in the upper planes are followed throughout both wings and centre sections except that towards the tips the place of the bracing tubes is taken by strips of duralumin longitudinally grooved to resist bending strains. Fig. 8 (7) shows this, and also makes it clear that the steel collars to which the bracing tubes are riveted are not found where strips are employed. The finish of the tubular bracing and commencement of strip bracing is illustrated in Fig. 6. Some of the wing spars are spliced, a tube of larger diameter being joined to one of smaller diameter by being pressed into a square section as shown in Fig. 19, and riveted in place. The lower drawing of Fig. 19 shows how two portions of equal-sized tube are joined by means of a steel collar.

The way in which the wings are joined to the centre sections is simple and effective. Reference to Figs. 8 (No. 8) and 16 (No. 9) (which are not necessarily drawn to scale), shows that each of the spars is fitted with a steel sleeve which fits inside the duralumin tube and is riveted in place. One sleeve carries a threaded collar bevelled as shown. The opposite spar has a similar internal liner of steel, riveted in place, and a loose internally threaded steel collar. The end of the liner is bevelled to take the bevel of the opposite spar. Thus, when the bevels are fitted together, and the collar screwed on to the male thread (tommy holes can be seen in the sketch), a firm and

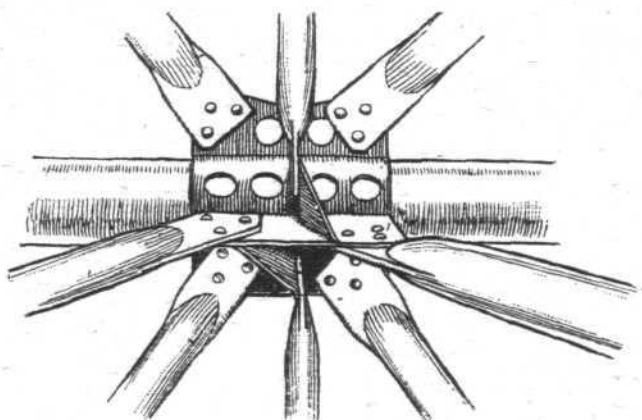


Fig. 5.

rigid joint is made. When it is remembered that all the numerous tubes are joined in this manner, it is evident that the junction of wing to centre section is of great strength. Indeed, the designer has trusted solely to these joints to take all lift, drag, and landing strains, for there are no other attachments of any sort between wings and centre sections.

The sheet duralumin covering is .015 in. thick (roughly 28 S.W.G.). It is corrugated so that a section cut parallel to the trailing edge is waved and the pitch of the wave is

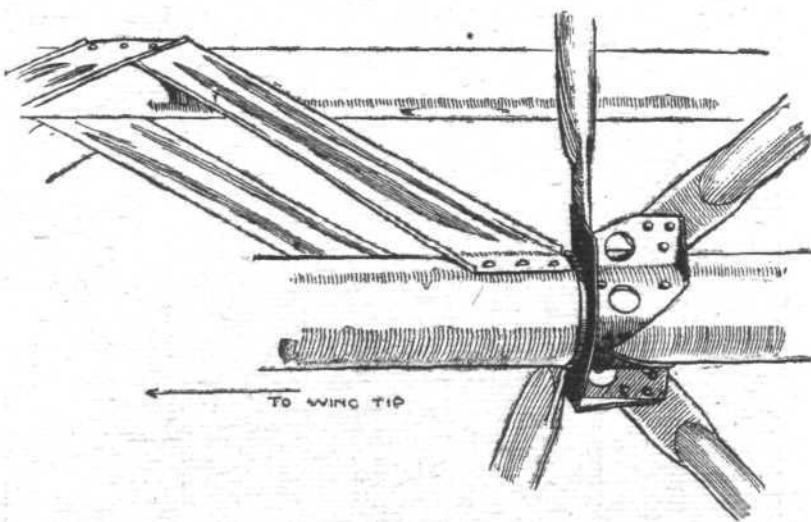


Fig. 6.

1 1/2 ins., the depth being 1/2 in. The sheets are riveted together by aluminium rivets spaced at intervals of 1.8 in. The sheet weighs 3.65 oz. per sq. ft. of area, not allowing for lap in riveting. (It may be remarked that an approximate

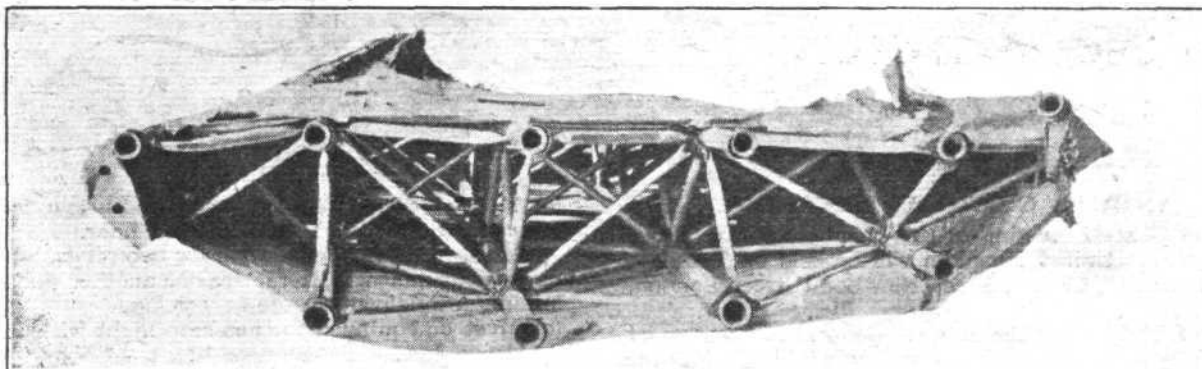


Fig. 7.

average weight for the usual German wing fabric, including dope, etc., is 1 oz. per sq. ft.)

Analysis of the material shows:—

Copper	..	..	4.46	Zinc	..	..	Nil.
Tin	..	..	Nil.	Manganese	..	..	0.28
Lead	..	..	Trace.	Magnesium	..	..	0.50
Iron	..	..	0.60	Silicon	..	..	0.39

This analysis shows that the material is "Duralumin."

Physical Tests

Test pieces cut from the sheet in two perpendicular directions gave:—

	A	B
Yield	18.2	18.1 tons per sq. in.
Ultimate	18.8	19.4 " " "
Elongation	3.3	3.3 per cent.
Reverse bends	3	3 "

These values correspond to a strength of 650 lbs. per in.

(The above figures are much below the requirements of Air Board Specification for Duralumin sheet.)

Micro-Examination

The micro-structure shows that the sheet has apparently not been heat treated after rolling, the section showing the elongated crystalline structure characteristic of cold rolled material.

Ailerons

It is evident from the scale drawings and photographs that the upper plane only is furnished with ailerons; that the ailerons are of the balanced type; and that each one reaches from the centre section to the wing tip.

The construction is simple. A duralumin tube passes from end to end, along the front lower edge, and to this is riveted the duralumin sheet which forms the lower surface of the aileron. A construction somewhat similar to that shown in Fig. 21 supports the upper sheet, and the two sheets are riveted together at the rear.

A hinged strip, about 4 ins. wide, and capable of moving upwards only, is fixed near the rear edge of the upper plane, thus bridging the gap between aileron and wing.

(To be Continued)

"AVIATION—PAST, PRESENT AND FUTURE"

UNDER this title Maj.-Gen. Sir F. H. Sykes, G.B.E., K.C.B., C.M.G., Controller-General of Civil Aviation, gave a most instructive lecture to the University of Liverpool on February 23. After rapidly sketching the early history of aeronautics—balloons, airships and aeroplanes—Gen. Sykes went on to show how aviation had developed in recent years, and said that it was now availing itself of the progress made during the War to meet the requirements of peace. He pointed out the types of aeroplanes and airships which can be utilised for civil aviation and the relative advantages of each aircraft. He went on to say that Britannia must rule not only the waves but the air, and consideration must, therefore, be given to the framework of an adequate Imperial Air Force and an efficient staff. The first line of defence or offence would be the Royal Air Force, and we must look to commercial aviation to provide capable aviators for the R.A.F., machines, factories and designing staffs in time of national emergency. The establishment of British commercial aviation on a sound basis was essential both in the interests of Imperial mutual understanding, of trade and of national security. One of the methods of assisting its growth was the organisation of the Imperial Air routes. Gen. Sykes then gave a *résumé* of the work done and being done in connection with the routes to Egypt, to India, to Australia, the Cape, Canada, etc.

Dealing with some of the practical work being done by aircraft, Gen. Sykes said the United States were making interesting experiments in the use of aircraft for forest patrol. During the years 1910 to 1917 forest fires resulted in an annual loss of \$3,758,356. From June to October of last year aeroplane patrols covered 202,009 miles, and discovered 442 fires. The advantages of air patrol were: (a) Visual command of those portions of forest inaccessible to regular patrols; (b) Ready detection of the origin of fires; (c) More efficient control and communication; and (d) Economy of time.

The achievements of air photography during the War were very remarkable. Not only was the whole system of enemy defence photographed, but the maps of such countries

as the Dardanelles and Palestine, which were often inaccurate, were rectified and amplified by the results of air photography. There were portions of Africa, Australia and Canada, only accessible to the ground surveyor with difficulty, which offer great opportunities for air survey. The Air Board of Canada was giving due consideration to the question of surveying the northern parts of all the provinces from Quebec westwards by air.

Recently, consideration has been given to the feasibility of conducting an expedition to the South Pole by air for the purpose of circumnavigating the Antarctic Continent, obtaining geological and meteorological data, information for the whale industry, and extending our knowledge of Antarctica generally. The mean temperature of the warmest month probably never exceeds freezing point, and the surface winds were remarkably strong and persistent, though there was a relatively calm passage between the Ross Sea and the Pole. Still, there were enterprising spirits who contemplated the expedition.

In Germany an air police force has been organised and was credited with having assisted in the maintenance of order during recent unrest. In the United States a seaplane patrol had been used at Los Angeles to locate schools of fish and to report to the local fishing fleet by wireless. In the Philippine Islands a contract was being entered into with an aviation firm for carrying doctors and medical aid to remote districts in the event of an outbreak of plague.

Commercial aviation, to be successful, must rest upon a sound economic basis. At present charges were high, but they might be regarded as experimental, though high speed would always necessitate high rates. Their reduction would be effected so soon as an increase of mails, passengers and freight was assured. Meanwhile, the State was giving its assistance by the organisation of air routes with the innumerable factors involved, wireless communication and meteorological research. Until such time as aviation could use its own wings, the fledgling must be assisted by the State.

Swedish-Finnish Air Mails

FROM information published by the *Dagens Nyheter*, it appears that the regular air service between Helsingfors

and Stockholm will begin in May next, one aeroplane flying from Helsingfors every day, carrying two or three passengers and 300 kilogrammes of mail.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

ANNUAL GENERAL MEETING

THE Annual General Meeting of the Members of the Royal Aero Club of the United Kingdom will be held on Tuesday, March 30, 1920, at 3, Clifford Street, New Bond Street, London, W. 1, at 6 p.m.

Notices of Motion for the Annual General Meeting must be received by the Secretary not less than 21 days before the Meeting, and must be signed by at least five Members. The last day for the receipt of notices of Motion is Tuesday, March 9, 1920.

Committee

In accordance with the Rules, the Committee shall consist of 18 Members. Members are elected to serve for two years, half the Committee retiring annually. Retiring Members are eligible for re-election.

The retiring Members of the Committee are:—

Brig.-Gen. The Duke of Atholl, K.T., M.V.O., D.S.O.
Maj.-Gen. Sir W. Sefton Brancker, K.C.B.
Mr. Ernest C. Bucknall.
Mr. G. B. Cockburn.
Col. F. Lindsay Lloyd, C.M.G.
Lieut.-Col. J. T. C. Moore-Brabazon, M.C., M.P.
Lieut.-Col. M. O'Gorman, C.B.
Group-Capt. C. R. Samson, C.M.G., D.S.O., R.A.F.
Mr. A. Mortimer Singer.

Any two Members of the Club can nominate a Member to serve on the Committee, provided the consent of the Member has been previously obtained. The name of the Member thus nominated, with the name of his proposer and seconder, must be sent in writing to the Secretary not less than 14 days before the Annual General Meeting. The last day for the receipt of nominations is Tuesday, March 16, 1920.

RACING COMMITTEE

A Meeting of the Racing Committee was held on Monday, February 16, 1920, when there were present:—Group-Capt. C. R. Samson, C.M.G., D.S.O., R.A.F., in the Chair, Mr. G. B. Cockburn, Air-Commodore E. M. Maitland, C.M.G., D.S.O., R.A.F., and the Secretary.

The Committee drafted a programme of Sporting Races for 1920.

A further Meeting was held on Friday, February 20, 1920. The following were present:—Group-Capt. C. R. Samson, C.M.G., D.S.O., R.A.F., in the Chair, Mr. G. B. Cockburn, Air-Commodore E. M. Maitland, C.M.G., D.S.O., R.A.F., and the Secretary. Mr. C. Grahame-White also attended at the invitation of the Committee.

The question of holding certain Sporting Races at Hendon was discussed.

THE FLYING SERVICES FUND COMMITTEE

A Meeting of the Flying Services Fund Committee was held on Friday, February 20, 1920, when there were present:—Group-Capt. C. R. Samson, C.M.G., D.S.O., R.A.F., in the Chair, Mr. G. B. Cockburn, Air-Commodore E. M. Maitland, C.M.G., D.S.O., R.A.F., and the Secretary.

Applications for Assistance.—Thirty-two applications for assistance were considered, and Grants and Allowances were voted amounting to £314.

The following is a translation of the Preliminary Regulations relating to the Antwerp Hydro-aeroplane Competitions, 1920, received from the Aero Club of Belgium:—

ANTWERP MEETING, 1920

II. Hydro-aeroplane Competitions (Second Fortnight in July.)

GENERAL CONDITIONS.

These competitions will be sub-divided into General Competitions and Special Competitions. Competing machines will be divided into two categories—

First Category (Speed).

The first category will consist of hydro-aeroplanes whose special characteristic is *speed*. In order to be placed in this category the machines must satisfy the following conditions:—

(a) Must be single-engined.

(b) Must when fully loaded, as defined below, have a level speed equal to at least 140 kiloms. per hour.

(c) Must have accommodation for two pilots, who must be able, without difficulty, to replace one another whilst in flight. Minimum weight of the crew: 150 kgs.

(d) Must be equipped for non-stop flight with full load of at least 600 kgs., under any weather conditions.

Minimum weight of the fuel; sufficient quantity of petrol, oil and water for a non-stop flight of at least 4½ hours.

(e) Must also be able to carry a minimum deadweight of 150 kgs., consisting of:—

	Kgs.
Instruments (minimum)	20
Wireless telegraphy or telephone ..	40
Apparatus (minimum)	40
Life-saving and protection apparatus, anchorage, reserve rations (minimum)	50

(f) Must have comfortable transport capacity for at least two passengers (minimum weight: 150 kgs.), with luggage (200 kgs. minimum); the latter must be in a closed and separate compartment. The passengers and luggage may be replaced by a minimum weight of 360 kgs., consisting of either colonial type trunks (70 × 40 × 30 cm.), each weighing 40 kgs., or of mail bags of 40 kgs. each.

(g) Must be able to start the engine without any outside assistance.

Second Category (Weight).

The second category will consist of hydro-aeroplanes whose special characteristic is *transport capacity*. In order to be placed in this category the machines must satisfy the following conditions:—

(a) Must have two or more engines.

(b) Must when fully loaded, as defined below, have a level speed of at least 110 kiloms. per hour.

(c) See First Category (c).

(d) Must be equipped for a non-stop flight with full load of at least 600 kgs. under any weather conditions. Minimum weight of the fuel: Sufficient petrol, oil and water for a non-stop flight of at least 5½ hours.

(e) Must be able to carry a minimum deadweight of 200 kgs., consisting of:—

	Kgs.
Instruments (minimum)	20
Wireless telegraphy or telephone ..	40
Apparatus (minimum)	50
Life-saving and protection apparatus, anchorage, reserve rations (minimum)	90

(f) Must have comfortable transport capacity for at least six passengers (450 kgs.), with luggage (600 kgs. minimum); the latter must be in closed and separate compartments. The passengers and luggage may be replaced by a minimum weight of 1,040 kgs., consisting of either colonial type trunks (70 × 40 × 30 cms.), each weighing 40 kgs., or of mail bags of 40 kgs. each.

(g) Must be able to start the engines without any outside assistance, each one being capable of restarting whilst in full flight.

Special Competitions

The competitions will consist of —

- (A) Competitions for endurance.
- (B) Competitions for speed.
- (C) Competitions for safety and flotation.

(A) COMPETITIONS FOR ENDURANCE.

(Open to hydro-aeroplanes of both categories.)

	Prizes.
First Category	First prize. *
	Second prize.
Second Category:	First prize.
	Second prize.

The competition will consist of making a non-stop flight, during three consecutive days, as many times as possible, over the following 600 kiloms. course: Antwerp-Tamise-Antwerp-Dôle-Antwerp.

(a) Flights may be made each day from sunrise until 10 p.m. (Greenwich time).

* The prizes will be published later, at the same time as the Official Regulations of the Meeting.

(b) Replenishments and repairs are allowed after each complete circuit of 600 kiloms., but only at Antwerp, on the river, at a place selected by the Organising Committee.

(c) In the event of replenishments or repairs being carried out anywhere than at the place selected, the circuit of 600 kiloms. begun will be cancelled, and must be recommenced at Antwerp from the official starting point.

(d) After the completion of each circuit of 600 kiloms., under the prescribed conditions, the crew may be partly or entirely replaced.

Classification.—Machines will be classified according to the number of points obtained.

Twenty points will be given for each circuit of 600 kiloms. accomplished in accordance with the above conditions.

In the case of ties, preference will be given to the machine which has accomplished the circuits in the shortest period of time.

Entries must be made six weeks before the opening of the Competition.

Entry fee: 500 frs., half of which will be returned after the Competition if the competitor starts.

(B) SPEED COMPETITIONS.

(Open to hydro-aeroplanes of both categories.)

<i>Prizes.</i>	
First Category :	First prize.*
	Second prize.
Second Category :	First prize.
	Second prize.

Classification will be made according to category.

(1) The speed of each competitor will be determined by the average speed at which he accomplished—at least three times—the circuit in the competition of endurance according to the conditions prescribed.

(2) The time of departure will be taken from the moment of leaving the water, and the time of arrival the moment of landing on the water.

(3) The circuits made in the competition for endurance may also serve for the speed tests if the competitor has mentioned this at the time of departure.

(4) If in the Competition for Endurance a competitor has accomplished more than three circuits of 600 kiloms., under the prescribed conditions, the three circuits made in the shortest time will be considered for his average speed.

(5) One point for speed per hour will be given for each kilom. or part of a kilom. above and over 140 kiloms. for machines of the first category, and of 110 kiloms. for those in the second category, with a maximum of 30 points for each category.

(6) Entries must be made six weeks before the opening of the Competition.

Entry fee: 500 frs., half of which will be returned after the Competition if the competitor starts.

(C) COMPETITION FOR SAFETY IN FLIGHT AND IN FLotation.
(Open to hydro-aeroplanes of both categories (classification according to category.)

<i>Prizes.</i>	
First Category :	First prize.*
	Second prize.
Second Category :	First prize.
	Second prize.

(1) Rapidity in starting without outside help, and of leaving the water with full load: 5 points.

(2) Speed in rising with full load: 15 points.

(3) Maximum height with full load: 5 points.

(4) Competition in navigation and flotation: 10 points.

* The prizes will be published later, at the same time as the Official Regulations of the Meeting.

Leave Pay for Retained ex-Airmen

THE Air Ministry makes the following announcement:—

Any ex-airman who at the outbreak of the War was serving as a soldier or territorial on a pre-War attestation, and who, before he proceeded to a dispersal station or was discharged, had been retained under the Military Service Act beyond the terms of his engagement (including the extra year under Section 87 (1) of the Air Force Act), and so became eligible for a month's leave, may, if the exigencies of service did not permit of his receiving such leave prior to demobilisation, now receive 28 days' pay and allowances under the following conditions:—

1. That he was actually retained for further service with the Colours before being discharged or being sent to a dispersal station.

2. That he was not discharged for misconduct.

3. That if he has been invalided and granted a pension

(5) Competition in anchoring and coasting: 5 points.

(6) Methods of life-saving of personnel by means only obtainable on board the machines, which shall remain floating in the middle of the river: 10 points.

Entries must be made six weeks before the opening day of the Competition.

Entry fees: 500 frs., half of which will be returned after the Competition if the Competitor starts.

(2) General Competitions

(A) GENERAL COMPETITION FOR COLONIAL HYDRO-AEROPLANES OF CATEGORY 1.

The classification will be determined by adding up the points obtained in the special competitions.

(a) Endurance.

(b) Speed.

(c) Safety whilst flying and floating.

To take part in this competition the competing machines must:—

(1) Reach Antwerp by air not later than the day before the opening day of the competition, before 4 p.m.

(2) Have obtained at least half of the points awarded for each special competition, and for the competition for endurance have made at least three complete circuits, under the prescribed conditions.

(3) Have remained floating without being obliged to go ashore during the special competitions; but it is not necessary to remain on the water for more than four consecutive days.

Entries must be received six weeks before the opening day of the competition.

Prize: F. Jacobs' Cup.

(The Jacobs' International Challenge Cup is reserved for Hydro-aeroplane Competitions.)

The winning machine will be bought for*

(B) GENERAL COMPETITION FOR COLONIAL HYDRO-AEROPLANES OF CATEGORY 2.

The machines will be classified by adding up the points obtained in the special competitions.

(a) Endurance.

(b) Speed.

(c) Safety whilst flying or floating.

To take part in this competition the competing machines must:—

(1) Reach Antwerp by air not later than the day before the opening day of the competition, before 4 p.m.

(2) Have obtained at least half of the points given for each special competition for speed and safety, and for the competition for endurance have made at least three complete circuits under the prescribed conditions.

(3) Have remained floating without being obliged to go ashore during the special competitions; but it is not necessary to remain on the water for more than four consecutive days.

(4) Have accomplished on the circuit fixed by the conditions of the competition for endurance a flight of at least 150 kiloms. with one engine cut off, except on leaving the water and during the first 10 minutes of the flight.

Entries must be received six weeks before the opening day of the competition.

Prize: H.M. King Albert's Cup.

(International Challenge Cup.)

The winning machine will be bought for*

Offices: THE ROYAL AERO CLUB,

3, CLIFFORD STREET, LONDON, W. 1.

H. E. PERRIN, Secretary.

he will receive only the difference, if any, between the pension he has already drawn during the period covered by the month's leave and a month's pay and allowances.

Applications under the terms of the notice should be made as early as possible to the Officer in Charge of Records, Royal Air Force, Blandford, and must in any case be made within three months of January 1, 1920. Any application which is not made within this period cannot be considered.

It must be clearly understood that any sums so payable are liable to be held against any issue of pension or out of work donation in respect of the period for which leave is now granted, or to meet any other public claim against the airman concerned.

Investigation of the numerous claims for this leave may possibly involve some delay in settlement, but all sums due will be remitted as early as practicable, without further applications from the airman concerned.

THE FUTURE OF THE R.A.F.

In his speech on the Army Estimates in the House of Commons, on February 23, Mr. Churchill said:—

"We must not expect too much in a hurry, and we must pursue an evolutionary rather than a revolutionary course. We must develop our processes for the next few years; I mean the demand for what is called a mechanical Army. Lord Fisher would like us (and many writers in the newspapers follow in this order of ideas and along this trend of thought) to confine ourselves at the present time to an aerial armada and a submarine fleet. Lord Fisher appears to believe that we could now make arrangements to hold our Empire on this basis. I do not believe we could do it now. Any way, how much would it cost?"

"The case of the Army and the Air Force is not quite so clear as the case of the Navy. The evolution must be more rapid because the plant involved is far less expensive, but although I cannot accept the view of those who say or write 'halve your Army and quadruple your Air Force,' it is an interesting hypothesis. I cannot quite accept that at the present time. I favour the steady increase of the Air Force at the expense of the Army and the Navy, and I believe that will be the tendency increasingly year by year, but I am sure that any such increase should only take place in proportion as the Air Force is actually able to discharge blocks of day-to-day duties which are in fact discharged by the Army and the Navy now, and in proportion that it is able to give us the assurance that in an emergency it will afford the same solid, if somewhat prosaic, foundation for our safety. I am anxious to give the Air Force an opportunity of substituting air power for military power wherever substantial economy can be shown, and provided the work can really be done.

"We have had an example of the possibilities of the Air Force recently in the Somaliland campaign, which, for a cost of about £30,000, achieved much more than we were able to do in one expedition before the War for an expenditure of over £2,500,000, and that would be £6,000,000 or £7,000,000 of the present currency. That campaign was particularly interesting, because it was the first time the Air Force was in command, and where the ships and the military or ground forces and the sea forces co-operated under the general direction of the aerial command. I propose to apply that principle to another field. I have directed the Chief of the Air Staff to submit an alternative scheme for the control of Mesopotamia, the Air Force being the principal force or agency of control, while the military and naval forces on the ground and river would be an ancillary power. Up to the present the General Staff have not been able to offer any solution of the problem of Mesopotamia, except by the employment of a military garrison, the cost of which will crush the country. I propose to invite, as it were, competitive tenders from the Air Staff. It may be that, by changing fundamentally the point of view and by applying an entirely new line of thought, a great saving in annual expenditure may be effected, and should a practical scheme, involving a real reduction, be framed on high professional authority, and should it receive the approval of the Cabinet, the Air Force's Estimates will be increased by the amount necessary to provide for the security of Mesopotamia, and the War Office Estimates will be decreased by what I hope will be a much larger sum.

"It will also follow that the Command-in-Chief in Mesopotamia would be vested in an officer of the Air Force, just as in other parts of the Empire, for tactical purposes of the Empire, the air forces are placed under the command of the local military Commanders-in-Chief, so that if the Air Force becomes responsible in this theatre, the naval forces on the river and the military forces on the ground would be under the command of the Air Commander-in-Chief. Whether this development is possible or not must depend upon the result of the staff studies which are proceeding both in the War Office and the Air Ministry, and on the amount of economies resulting from the change, and the degree of reliance which can be placed upon aerial methods of control. I do not prejudge the issue, but I am sure the Committee will see that the Air Force is being given every possible chance

of expansion and developing, provided they can show any specific case like this, that they really can do the work that has hitherto been done by the other branches of the Services, and can do it with a substantial saving in cost."

Maj.-Gen. Seely, in the course of the debate, said: "On the subject of the division between aerial and military power, to which the right hon. gentleman devoted a portion of his remarks, I think the discrepancy is deplorable. I will take the case of Mesopotamia. He tells us he hopes to put it up to auction, competitive tender; but why did he not do it before? Enough was known about it to have enabled him to make a very great and real reduction in the garrison in Mesopotamia this year. But the air has many enemies, and I have been at some pains to find out what is happening in Mesopotamia, and shall be glad to give the result of my enquiries to the right hon. gentleman. A great many of the older school of soldiers do not believe in the air, and now they give it a grudging belief, and will not allow it to perform its functions in the proper way. They say, 'Of course, we must have some aircraft, but they can only be ancillary—they are only the eyes of the army—and a few machines flying over the enemy to complete the rout will be of use.' But they will not let air power be used as air power should be used. If you have a completely separate air power, and enable them to work under the political heads, you will save yourselves certainly millions of money, and I am quite sure you will save thousands of lives. The power given to the political chiefs to go to any threatened point and there to warn the tribes of the impending disaster to them if they are not complying with our wishes is a power which will really stop any number of these small wars. It has stopped a good many already, but it has not stopped them all. There was a punitive expedition to Mesopotamia the other day, and it took it 15 days to get to a place where aeroplanes can get in three hours; but the aeroplanes could not prevent the necessity for it, as they ultimately did after the expedition had gone, because they were under the control of the military authorities and not of the political chiefs. We have had an instance of it, as the right hon. gentleman says, in Somaliland. We were told that for £30,000, I think the right hon. gentleman said, we did more than we had done with £2,500,000 before. Yes but what were the casualties in each case? The Committee will remember that in the operations against the so-called Mad Mullah we suffered thousands of casualties. In a tiny little operation, in the middle of the War, one British officer was killed and five were wounded in attacking one little outpost, and in the main operations we had thousands of casualties. The right hon. gentleman himself tells us that the operations on this occasion had more far-reaching results than any previous one. What were the casualties? Amongst the European officers and men engaged the casualties were *nil*, and, so far as information has been received from the Colonial Office, the total casualties of all the operations involved in the destruction of the power of the Mullah was one native African soldier died of wounds and one slightly wounded. That is what happens when you let air power have its way. But the right hon. gentleman knows very well that it was not very easy to let air power have its way, even in the case of Somaliland. All through this business, as I see it, the right hon. gentleman has been gradually driven over to the reactionary side. He has been angry with those who have pressed him to adopt new methods unduly, and he has been ultimately driven to the reactionary side, and we see the results in these Estimates. My right hon. friend has fallen into this error, if error it is, because he has not been able to give enough time to the two things he tries to control. I do not wish to dwell at further length upon this, except to say that I am quite sure he cannot preside over two councils any more than a steam engine can pull two trains on different lines. I am quite sure it is no use trying to be a sort of political Capablanca, who can play a number of games at once and win or draw them all. The right hon. gentleman has lost one game already, and it is my conviction that, unless he sticks to one job, which I hope will be the Army, very soon he will lose them all."

Lympne as Aerial Dover

It is understood that Lympne aerodrome has passed into the control of Mr. D. A. Davis, D.F.C., late R.A.F., as a civilian Customs aerodrome. Hitherto Lympne has been under the Air Force *personnel*. Mr. Davis now controls civilian traffic as Civilian Traffic Officer under the Controller-General of Civil Aviation. He was formerly on duty at Hounslow aerodrome.

The Flight to Timbuctoo

A GREAT deal of anxiety has been caused in Paris in regard to the fate of Commandant Vuillemin, who left Taman-rasset on February 18, with Gen. Laperrine as passenger, for Timbuctoo. In the 550 miles between these two places there is one post, Burrem, which is in wireless communication with Timbuctoo and Dakar, but it has had no news of the missing machine.

THE OPERATIONS IN SOMALILAND

THE Secretary of the Air Ministry is instructed by the Secretary of State for Air to issue the following statement:—

"The Air Force unit which has assisted to break the Mullah's power in Somaliland, amounted to 22 officers and 159 other ranks, under the command of Group-Capt. R. Gordon, D.S.O.; these numbers included a considerable medical staff equipped with a very complete hospital outfit. The aeroplanes with which the unit operated were 12 De Havilland 9's with B.H.P. engines. One of these aeroplanes was fitted up as an aerial ambulance to take a stretcher case with attendant.

"Sanction was obtained for aerial operations on October 8, 1919, and by the middle of November all personnel and stores were en route to Egypt, which was the assembly station for the unit. The War Office assisted by permitting a flight of personnel to be withdrawn from Egypt for the operations, and the Admiralty rendered important aid in ordering H.M.S. *Ark Royal* to embark the whole unit with its stores at Alexandria and take them direct to Berbera; the shipping difficulty was thus overcome.

"Previous to the arrival of the main body of the expedition advanced parties had been sent to Somaliland to complete administrative details, such as rations, evacuation of casualties, etc., and to prepare aerodromes and advanced landing-grounds for the purposes of the operations. Berbera was made the base, Eil Dor Elan the main advanced aerodrome, with subsidiary landing-grounds at Las Khorai and Eil Dab.

"On December 31 H.M.S. *Ark Royal* with the main body of the expedition arrived at Berbera, and the erection of aeroplanes was at once pressed on in order that the Mullah should not get warning of the impending attack.

"By January 20 all was ready to bomb the Mullah, whose headquarters were reported at Medishi, 200 miles east of Berbera.

"It had been agreed between the Colonial Office and the Air Ministry that the first part of the operation should be a purely aerial attack. Should this be successful in breaking up the Dervishes, the local military forces would attempt to round up the enemy, capture his stock and destroy his forts. Everything went according to plan. On the 21st the Mullah's headquarters at Medishi and the fort at Jidali were located and bombed, and machines descended to low heights and inflicted heavy casualties on the fleeing Dervishes and their stock. The attack was repeated on the 22nd and 23rd. On the latter date the Dervishes were caught concentrated

preparatory to moving off, and heavy losses were inflicted and great panic created. By January 24 the Dervish force was scattered among the hills, and targets for aerial bombardment were hard to find. Independent aerial operations therefore ceased, and the R.A.F. prepared to co-operate with the local military forces.

"On the 28th these troops took Jidali when it was ascertained that the Mullah himself narrowly escaped being killed in our first bombardment; his uncle being killed at his side and the Mullah's clothes singed. It was also reported that the Mullah with most of the Dervish leaders had broken south on this date. On the morning of January 31 the Air Force located the Mullah's party east of Eil Apweina, and heavily attacked it, dispersing the Dervishes in great alarm. From this date aerial operations took a normal course, and the Air Force was chiefly employed in reconnaissances, propaganda dropping and in message-carrying, which ensured good co-operation between the main bodies of troops. These were spread widely over the Protectorate in the attempt to catch the Mullah, who was apparently making for Tale. This latter place was located, photographed and bombed on February 1. A few days later it was ascertained that the Mullah had taken refuge in one of the forts of Tale; this position was captured on February 11, but the Mullah with 70 horsemen escaped in the direction of Italian territory.

"By the aid of the Air Force operations have been concluded in the space of three weeks; in this time the Mullah has been reduced from a power in the land with many armed and aggressive followers rich in stock to a fugitive accompanied by a faithful few. The problem which has exercised the minds of the Protectorate Government for seventeen years, and caused an expenditure of millions of money, has it is hoped been dealt with at a minimum of cost, and with practically no casualties.

"The general plan of the air campaign was prepared under the directions of the Chief of the Air Staff."

Col. Amery, in the absence of the Secretary of State for the Colonies, has sent a telegram asking the Governor of Somaliland, Mr. G. F. Archer, C.M.G., under whose general control the recent operations against the Mullah were carried out, to convey his thanks to all officers. He adds:—

"That the complete overthrow of the Dervish power should have been secured in so short a space of time and at such a trifling cost affords high testimony to the skill with which the operations were planned and the ability and determination with which they have been carried out."

THE CAIRO TO CAPE ROUTE

Preparing the Aerodromes on the Southern Section

DETAILED reports which have recently been received from the officer in charge of No. 3 Survey Party of the Cairo to Cape air route, Maj. Court Treatt, R.A.F., give a vivid idea of the extraordinary difficulties which confronted him in carrying out his portion of the survey and the subsequent construction of aerodromes. This party was responsible for the southern area, covering some 2,000 miles of the route, from Abercorn to Cape Town; and in the northern portion of this area some of the most difficult country was encountered. Maj. Court Treatt had with him as assistants the following officers:—Capt. Marcus, Shortridge and Sutton, Lieuts. Bell and Holthouse, and a few other ranks. For labour dependence had to be placed on several hundreds of natives.

Compared with that of other parts of the route, the nature of the country south of Pretoria was favourable for the formation of aerodromes, as the surface was generally grassy. Once the sites had been selected the work was light, except for the removal of ant-heaps and rock outcrop, though, as some of the former were 60 ft. high and 40 ft. in diameter, considerable labour was involved in dealing with them.

The greatest difficulties were met with in Northern Rhodesia, where the soil was found to consist mostly of (1) red sand, (2) black soil, (3) red soil. The red sand is quite unsuitable for aerodromes, as during the dry season the surface is converted into thick dust in which an aeroplane would sink up to the axles of the undercarriage. The black soil, on the other hand, though apparently suitable during dry weather, becomes hopelessly boggy during the rains. For instance, at N'dola, at a time when there had been no rain for six weeks, water lay at a depth of from 6 ins. to 3 ft. below the surface. The red soil was found to be the best, since its surface remains hard even during the heavy rains. The work of preparation,

however, was extremely hard, as this soil is usually well timbered, and also covered with thick bush, and clearance involved the felling and removal of trees and the extraction of all stumps. Owing to the size of the timber it was frequently found necessary to make an excavation 10 ft. in diameter in order to uproot a single tree, and even the smaller trees had to be dug out to a minimum depth of 2½ ft. so as to get rid of the lateral roots which very soon sprout up. The grass, also, which grows to a height of from 7 ft. to 12 ft. had, of course, to be cleared before the other work could be proceeded with. This Rhodesian grass resembles bamboo more than grass, and during the rains grows at an extremely rapid rate.

When the site of an aerodrome had been cleared and, where necessary, levelled, it was replanted with suitable grass. For identification each aerodrome was marked with a large circle composed of white stone flush with the ground and usually about 100 ft. in circumference, which would show prominently from the air. The angles of the aerodromes were similarly marked by "L's," and a "P" was placed on all regular aerodromes (as distinguished from the emergency landing-grounds) to mark the position of the petrol, oil and water dumps, which were usually placed underground. As illustrating the labour which was involved, it may be mentioned that from one aerodrome some thousand trees were removed; at another a sluit (ravine) 600 yards long by 30 yards wide had to be filled in with stones; while at a third 1,000 wagon-loads of stones and rock outcrop were collected and carried from the ground. At aerodromes where no water was readily available special wells were sunk, and at others liable to flooding by one night's rain a drainage system had to be undertaken.

The survey parties had very often to cut roads for the cars

and motor-cycles which accompanied them, and to improvise rafts from old petrol-cans, etc., to enable them to cross the rivers. A somewhat unusual difficulty experienced in the grass country was the fact that large quantities of grass seeds were forced through the radiators of the motors. Sometimes after one day's run the undershields were found to be covered with seeds to a depth of 3 ins. or 4 ins. The tsetse fly was a constant source of trouble, and it was found almost impossible to indicate the actual location and depth of the various fly belts. It is possible that the traffic of the war transport has spread this pest considerably, and that areas previously immune are now infested. In addition to the *Glossina morsitans* (the ordinary tsetse fly), the *Glossina trypanosomiasis* (the carrier of the deadly sleeping sickness) was also prevalent in some of the districts in which this party was operating.

In the fever districts progress was not infrequently seriously handicapped by sickness, and, though fortunately there were no deaths among the British personnel, a number of native labourers died from fever while working on the aerodromes. The white officers were often isolated for long periods, and one lived alone without relief for five months at an aerodrome where fever was particularly prevalent.

It should be realised that in much of the country traversed the tall grass renders it impossible for a man on the ground to see more than a few feet. In such cases the procedure adopted when the site for an aerodrome had been tentatively selected was as follows:—

Four boundaries, usually 800 yards long, were first cut, and then two diagonal traverses were made from corner to corner, from which the grass and all obstacles except large trees were removed. This gave the approximate configuration of the whole area with the least labour, so that if the ground was by this method found to be unsuitable the site could be abandoned before much labour had been expended.

THE FLIGHT TO THE CAPE

THERE are at the time of writing (Wednesday) three machines actually flying on the Cairo to the Cape route, the Handley Page, piloted by Maj. Brackley, having started on February 23. The progress of the other machines has been as follows:—

"The Times" Aeroplane

Instead of the three days anticipated, five days were actually spent at Mongalla, overhauling the machine and engines; an attempt to start being made at 6 a.m. on February 20. Some difficulty was experienced in rising, as the magneto cutout on the starboard engine, and the Vickers-Vimy was accordingly landed again, with some difficulty. The defective part having been replaced, a fresh start was made at 9.40 a.m., and the machine was reported at Rejaf at 10 a.m. A landing was necessary at Nimule (in Northern Uganda) owing to the engine heating, and on the rough ground the tyres were punctured and the tail-skid injured. After repair (including patching a leaky cylinder) had been carried out, an attempt to restart was made, but a valve on the port engine was burnt, and so the crew had to camp out. Repairs were completed by noon the next day, but owing to the great heat the machine would not rise to a safe height, and although the lions created a disturbance it was decided to camp out again. At dawn on the 22nd a good but slow journey was made to Jinja. Magneto trouble entailed so much delay on February 23 that it was impossible to start on account of the heat, but they left Jinja

Hounslow Aerial Lighthouse

THE Air Ministry Notice to Airmen (No. 18):—

"An aerial lighthouse is again operating at Hounslow. The lighthouse throws a revolving beam which attains its maximum brilliancy once every five seconds and is working every night from sunset to sunrise.

"A second lighthouse which was in operation and which gave three flashes every ten seconds has been removed from the aerodrome.

"This notice cancels Notices to Airmen Nos. 1, 3 and 11.

Meteorological Office and the Air Ministry

At the monthly meeting of the Royal Meteorological Society on February 18, after Capt. C. J. P. Cave had read a paper on "The Status of a Meteorological Office and Its Relation to the State and to the Public," the society adopted the following resolution:—

The Royal Meteorological Society observe that in the Air Estimates for 1919-20 published last December there appears a sum of £12,000 as a supplement to the grant in aid of the Meteorological Office. It would appear from this

For clearance the "task" per man was a "skonkewan" (a piece of ground 10 yards square). This was marked out over night, and the native's job was first to root up the grass and stack it in heaps, and then, when the trees had been felled, to extract the stumps to the depth required. The men were usually divided into gangs of 35 each in charge of a "Kapi-tave" (overseer), two gangs working a line of 600 yards. On the larger-sized aerodromes there were usually about 60 "skonkewans" to each line, a reserve of 16 men being left to clear up the grass heaps and any remaining stumps, or to assist with any particularly bad patches.

The execution of the arrangements for the Cairo to Cape flight were only made possible by the valuable co-operation of the local authorities, who in some cases gave the sites for aerodromes free of charge, and in others provided the land at nominal rentals, and by the voluntary aid given by the people throughout the country. These included ex-R.A.F. officers, local officials, private individuals and others, who assisted with their local knowledge, and in many cases gave help in the necessary work. The assistance given by Khama, Chief of the Bo'mangwapo group of the Bechuanas, was particularly valuable. In addition to converting his own racecourse at Sorowe into an aerodrome, he gave the land necessary at Palapyo, and when heavy rain, fever and labour difficulties were handicapping the survey party he specially mobilised some of his regiments to co-operate.

Intense interest in the project was everywhere manifested by all classes of the population. A B.E. 2E machine flown over part of the route attracted great attention. Natives trekked in from very great distances to see it, while Louiniki, King of the Barotso, travelled with all his headmen as far as Livingstone to witness its flights. On the whole, considerable political importance can be attached to the moral effect produced by the appearance of the aeroplane in this part of Africa.

at 6.30 a.m. on February 24, and reached Kisumu, in British East Africa, at 9 a.m. Dr. Chalmers Mitchell reported that all the crew were well and in good spirits.

The "Silver Queen II"

Having installed the undamaged engines, radiators and instruments of the South African Government's "Silver Queen" in a new Vickers-Vimy, Col. van Ryneveld left Heliopolis at 6.45 a.m. on February 22. He was reported at Assuan at 1.40 p.m., and reached Wady Halfa at 3.50 p.m., having to come down then owing to a strong head wind. He left at 1 p.m. on February 23, and reached Khartoum at 6.55 p.m. Then it was necessary to repair leaking water-jackets on the port engine.

The Handley Page

This machine reached Heliopolis at 1.15 on February 20, having flown from Athens to Sollum, the previous day in five hours. It had been delayed at Brindisi until February 18 after the unfortunate accident in which a mechanic was decapitated by a propeller. A new propeller had to be sent from England and another mechanic has joined the crew. The machine left Cairo at 9.20 a.m. on February 23, and reached Assiut; the next morning it went on and landed at Assuan at 1.45 p.m.

The Airco

This machine has now progressed another stage, having been reported at Rome on the evening of February 21.

that it is intended that the finances of the Meteorological Office shall pass under the control of the Air Ministry.

The Meteorological Office deals with a variety of problems of high scientific and practical importance, some of which have no bearing on the work of the Air Ministry, but are closely connected with the work of other Government Departments. While recognising to the full the great benefits to the meteorology of the upper air likely to accrue from a close association with the service to which a knowledge of the upper air is so essential, and which possesses such facilities for its investigation, this society cannot but feel misgiving that there may be a tendency for other branches of meteorology to receive less than their due attention if one Government Department has the sole control of the finances and management. The Society, therefore, are of opinion that the Meteorological Committee should continue to have full control of the expenditure. It has been the practice in the past, before any change was made in the body administering the Meteorological Office, for an enquiry to be held by a Departmental Committee.

CORRESPONDENCE

[The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.]

PARACHUTES ANCHORED AND FREE

[1997] I had not intended to trouble you again, but it seems advisable to clear up the confusion which has arisen owing to the different meanings attached by myself and your other correspondents to the term "Positive."

And first, may I say I unreservedly accept Mr. Calthrop's disclaimer at the commencement of his letter in the spirit in which it is made. The term "Positive" was used by me to denote that type in which, generally speaking, the parachute is withdrawn from its receptacle by the positive pull on the life-line engendered by the difference in motion of the passenger relatively to the aeroplane. I do not like the word, and should not have employed it had I not been under a misapprehension as to its use by the Parachute Section. I much prefer my own term "Anchored," and would define it thus—"A parachute system in which mechanical connection between the flying machine and the passenger persists after the latter has left the machine and in which the withdrawal of the parachute from its case is effected or initiated wholly or partially by the subsequent difference in rate of direction of motion of the passenger relatively to the flying machine."

A "Free parachute," on the other hand, is one in which there is no mechanical connection between the machine and the passenger after the latter has left it, and in which the withdrawal of the parachute is independent of the rate or direction of movement of the aeroplane relatively to the passenger. At present the "Free" type is very much in the background, but if there is any truth in my contentions, this type must come much more to the front, and this division into "Anchored" and "Free" types represents a fundamental difference in the mechanical principle.

I will accept Mr. Calthrop's and Mr. Smith's use of the term "positive" to denote the "open mouth" type of parachute, and perhaps in return they will allow me to substitute for "non-positive" which is a merely negative qualification, the terms "pneumatic" and "semi-pneumatic," according to whether the parachute is inflated solely by impact of air at the mouth or whether it is assisted by an auxiliary mechanical device other than the permanent open mouth.

Thus we can divide the "Anchored" and "Free" parachutes each into three sub-divisions:—Positive opening, Pneumatic, Semi-pneumatic.

Now, if Mr. Smith will refer to his letter again and substitute "anchored type" for "positive," he will see that "my sweeping condemnation," as he calls it, refers to the "anchored" system and not *per se* to the "open mouth" method of stowing, which is admittedly admirable.

Now, to turn to Mr. Calthrop's letter—here, again, the same confusion has arisen owing to the sense in which I applied the term "positive" with the result that I am afraid Mr. Calthrop thinks I have drawn an unfair inference from the accident in America. I certainly understood that he claimed "infallibility" for the Guardian Angel parachute system as a whole, and not merely for the "open mouth" method of stowing, and I cited this accident to show that the "anchored" system used in this parachute, requiring a life-line mechanically connected to the flying machine, was *not* infallible. I cannot see how his proposal to put this life-line in a sunken groove makes much difference; when the critical moment arrives it will have to leave its groove and it will then be as I said "dangling in proximity to the machine" just the same as if it had never been in its groove. Touching this accident I entirely accept his account, more especially as it is exactly what I heard myself.

Mr. Calthrop is indisputably the pioneer in scientific life parachute construction, and although I have been experimenting with parachutes I think as long as himself, it has been only in connection with flares and other dead loads till quite recently, and it is with some deference I am going to say this; but it seems to me that his remarks as to the necessity for "shielding" the rocker, and his plea that "all projections and rugosities should be 'smoothed off' the fuselage," constitute the most deadly criticism of his own and similar "anchored" systems that has yet appeared. The late Lord Rayleigh, one of the greatest mathematicians of his day, assured me that it was impossible to forecast by mathematics what would happen to any of these parachute systems in case of an aeroplane crashing, there being too many uncertain factors. We must form an opinion by common sense. Common sense suggests that a parachute system which requires "all projections and rugosities" to

be removed from the fuselage does not seem likely to be reliable in the event of a machine falling in a "spinning dive" or rolling over with perhaps one broken wing hanging down in an unknown position. Mr. Calthrop has cited two of his many patents as examples of "special adaptation to environment," but he has made no reference to those other forms admittedly designed to cope with *different types of accident*, and to which my comments were especially directed.

I am told that the Spencer "Salvus" parachute is a beautiful piece of mechanism, but if I understand it aright, it falls under the head of "anchored" parachutes.

Apart altogether from the question of reliability, no one has yet explained how more than one or two of these anchored parachutes will be carried on one machine whereas with the "free" type, each passenger carries his own parachute.

In conclusion may I say this, and I trust Mr. Calthrop will not take it as implying the slightest criticism of himself, as nothing is further from my thoughts; that throughout this correspondence, at the sacrifice perhaps of more effective replies to some of your correspondents' arguments, I have purposely avoided any reference to my own "compound parachute system," because I felt it would be a pity to let this correspondence degenerate into a mere discussion between different inventors as to the merits of their respective inventions. As you, Mr. Editor, said, it is much to be desired that outsiders with parachute experience should join in the discussion. Unfortunately I am afraid there is no man living who has escaped from a flying machine in process of crashing. It is all the more to be hoped that the authorities should not delay further in carrying out really practical tests as suggested by Mr. Smith. A fine opportunity was lost when all those old flying machines were broken up after the Armistice.

Travellers' Club.

H. S. HOLT.

P.S.—Since writing the above, I have had the pleasure of reading Major Orde Lee's letter. The Major is, I believe, in the service of the Calthrop Co.; otherwise his opinions as a practical parachutist would carry even greater weight. Like your other correspondents, his letter is largely a reiteration of the necessity for non-entangleable rigging and for the "held-open" mouth or "positive opening," to counteract suction. No one in his senses disputes the necessity for the former, or the efficiency of the open mouth as an antidote to suction, that worst enemy of the parachute, owing to its sucking the inner surfaces of the parachute together and resisting inflation. But it does not seem to have occurred to any of your correspondents that it might be possible to construct a "free" parachute system with non-entangleable rigging, and in which there is no suction potential or actual. Such a parachute will function regularly and certainly, unassisted by the "open mouth," with its several drawbacks and limitations. To "eliminate" is usually better than to "counteract."

FLYING AND CURIOUS PHENOMENA

[1998] In answer to your letter appearing in *FLIGHT* of February 12, under No. 1994 as reference, I would tell you that if you would have dived on that occasion you would have seen the "top" of the rainbow, and halfway to the ground you would have seen the rainbow *completely round*. I have witnessed it myself as I was flying with my father and another pilot at Brussels in October, 1919 (they both saw it, too).

The explanation of this is quite simple and natural. You will find it in the explanation of the rainbow itself.

WILLY COPPENS,
Belgian Air Attaché in London.

PROPOSED AERO CLUB OF SOUTH AFRICA

[1999] At a meeting held recently, and attended by Major H. R. Coningsby, representative of Messrs. Vickers and Messrs. Wolseley Motors, Ltd., Capt. P. C. Passman, of Messrs. Nieuport and General Aircraft Co., Ltd., and representatives of Messrs. the Handley Page South African Transports, Ltd., together with many ex-R.A.F. officers and others interested in the advancement of aviation in South Africa, it was resolved that a club be formed with aims as follows:—

(1) That it be called the "Aero Club of South Africa," and run on the lines of the "Royal Aero Club of the United Kingdom."

(2) To obtain recognition from the "International Aero-nautical Federation," as a responsible body governing civil

aviation matters in South Africa, preferably by affiliation with the "Royal Aero Club of the United Kingdom."

(3) The encouragement and development of the study of aeronautics in all its branches, to provide centres of information and advice on matters pertaining to aeronautics, and eventually to obtain country clubs or bungalows at service or municipal aerodromes, where members could house machines and participate in flying.

(4) To provide a reference library of works of aeronautics.

(5) To keep members supplied with information of new inventions, improvements and developments in aeronautics.

A small working committee was formed to approach the

heads of aviation companies in the Union, with a view to obtaining their support, and, therefore, we beg to invite their views on the subject.

In the meantime, the committee is endeavouring to ascertain the probable membership, and is also approaching the Aeronautical Society of South Africa and any other like societies or clubs existing, or in course of formation, with a view to unity and amalgamation.

H. R. CONINGSBY,
Chairman.

A. S. HEMMING,
Hon. Secretary.

ROYAL AERONAUTICAL SOCIETY NOTICES



1. *Election of Members.*—The following members were elected at a Council Meeting held on Tuesday, February 17:—

Associate Fellows.—Comdr. F. L. M. Boothby, R.N., Squad-Leader J. E. M. Pritchard, Miss I. L. Peatfield, E. H. Mitchell.
Hon. Member.—Mr. Alma Baker.

Members.—Flight-Lieut. H. Gooch, G. Oliver, R. W. Potts.

Associate Members.—K. Douglas, K. E. Garnett, R. Graham, A. G. E. Joyce, T. W. P. L. Mullings, L. G. S. Reynolds.

Students.—H. G. Brown, R. H. Walmsley.

2. Maj. G. C. Tryon, Under-Secretary of State for Air, will preside at Maj-Gen. Sir W. S. Brancker's lecture on April 14.

3. The next lecture will take place on Wednesday, March 3, when Professor B. Melville Jones, Associate Fellow, will read a paper on "Flying Over Clouds in Relation to Commercial Aeronautics." Lieut.-Col. H. T. Tizard, Fellow, will take the chair at 8 p.m. at the Royal Society of Arts, 18, John Street, Adelphi, W.C. 2.

4. *Associate Fellowship.*—The Council have decided to

institute forthwith the procedure which was postponed during the War, of requiring future candidates for Associate Fellowship to pass a qualifying examination in the science of aeronautics, or to produce evidence of having passed some equivalent examination recognised by the Council. A Committee is being appointed to make the necessary arrangements for setting up the requisite machinery on the lines of other technical bodies.

5. *Annual Reports and Journals.*—The following numbers of the early "Annual Reports" of the Society and of the *Journal* are missing from those available for sale. The Secretary would be glad to hear from any members who may have copies of these for disposal. Annual reports for the years 1866, 1867, 1874, 1883, 1884. Copies of the *Journal* for October, November, December, 1918, and January, 1919.

6. The Library is now open every day, including Saturdays, for the use of members from 9.30 to 5 p.m.

7. The Council acknowledge with thanks the presentation to the Library of "Air Supply to Boiler Rooms of Modern Ships of War" from Mr. R. W. Allen, and an account of the early experimental work of Laurence Hargrave from Mr. C. Alma Baker.

February 20, 1920.

Secretary.

CAMBRIDGE UNIVERSITY

The third meeting of the Society was held in the Engineering Laboratories on Wednesday, February 18, at 8.30 p.m., Prof. B. Melville Jones being in the chair, when Squadron-Leader G. H. Norman, R.A.F., Chief of the Engine Research Department, R.A.E., gave a lecture on "Air-cooled Engines."

The lecturer said air-cooled engines could be divided into three classes—(a) rotary, (b) stationary, either line or V-type, and (c) radial, and proceeded to deal with each class in turn.

He pointed out that the cylinder of the rotary engine was bad, because of its low mean effective pressure, and the reasons for this were: Windage loss, cramped valve arrangement, and insufficient cooling. He then dealt with the stationary type, including the 70 and 80 Renault and the early R.A.F. models, in which, he said, the cooling of the cylinder heads was insufficient; but this has been largely remedied by the means of fins of considerable height, actually on the head in the later designs.

It was in the radial type, however, that he was chiefly interested, and he sketched the development of this class of engine from the first "Anzani" down to the present-day.

He discussed the copper-plating of the fins as a means of

AERONAUTICAL SOCIETY

equalising the heat in a cylinder, and showed how, by making the head of hemispherical shape, larger valves could be used. In the case of an aluminium head screwed on to a steel barrel, he emphasised the need of annealing the head at 400 to 450 deg. Cent. for three or four hours before screwing on. This will give maximum growth, and once it is screwed on no slackening need be feared, whereas, without the annealing process, an ever-increasing slackness is encountered.

With regard to pistons, the lecturer said the use of aluminium had become almost universal, and this was due not so much to the question of weight as of coolness.

In conclusion, he said that the air-cooled engine had been criticised as unreliable, both severely and oft, but he maintained that it was unfair to label air-cooled engines unreliable as such. The cylinders are good, and the exhaust valves keep as cool as those of any water-cooled engine and give very little trouble. He dealt at length with the very favourable comparison both in weight per horse-power and in fuel consumption with the water-cooled engine, which is also very much more trouble than the air-cooled in winter and in cold climates.

PERSONALS

Death

Capt. F. H. PRICHARD, R.G.A., who died of typhus at the headquarters of the British Military Mission in South Russia, on February 3, was the third brother in his family to give his life for his country. Capt. Prichard was born in 1888, and educated at Cheltenham and Woolwich. He was gazetted to the R.G.A. in 1908, but was with the Flying Corps when the War broke out. He served as an observer in the R.A.F. in France in 1915, and as a result of a forced descent in June of that year was interned in Holland until the signing of the Armistice. In July, 1919, he qualified as an interpreter and proceeded to Russia as liaison officer with the British Military Mission. Of his brothers, Lieut. R. G. Prichard was killed in action in France, in April, 1915; and Lieut. F. G. Prichard died of wounds in August of the same year.

Married

Lieut.-Col. S. JANSEN, formerly Deputy-Inspector of Transport at the Air Force camp at Hurst Park, was married on February 17, at Brompton Parish Church, to Miss GWENDA

GLUBB, only daughter of Major-General Sir Frederick Glubb.

Flight-Lieut. RAYMOND WHITAKER, R.A.F., son of Mr. and Mrs. Arthur Whitaker, of 52, Cadogan Square, was married on February 12, at Salisbury Cathedral, to Miss HILDA MARGARET SHARP, daughter of Lieut.-Col. and Mrs. G. E. Sharp, of The Close, Salisbury.

To be Married

THE engagement is announced between ARTHUR RIMINGTON GLAZEBROOK, only son of Sir Richard Glazebrook, K.C.B., F.R.S., and Lady Glazebrook, of Coton End, Cambridge, and JOYCE HONOR, eldest daughter of the late JOHN WILLIAMS WATSON, of Marks Barn, Crewkerne, and of Mrs. Watson, Upland Cottage, Kingsley Green, Haslemere, and eldest granddaughter of the late William Latham, K.C.

Item

Air-Marshal Sir HUGH TRENCHARD, Bt. (Chief of the Air Staff), had the honour of being received by the King at Buckingham Palace on February 21.

AIRISMS FROM THE FOUR WINDS

It is a post-War re-awakening note that is sounded by the challenge to the Aero Club of France of the Royal Aero Club for the possession of the Gordon-Bennett Aviation Cup. We've got some pretty fast machines now, and some of our pilots are not to be despised when good Sport looms on the horizon. So when the race materialises in the autumn, Province Beauce, where the event will probably take place, should obtain some notoriety as a flying ground.

As one surmised would be the case, the Bolshies are now becoming possessed of regular squadrons of aeroplanes, and in the Askhabad area, on the northern frontier of Persia, some of these are getting pretty busy. Amongst other purposes the planes are being used for distributing propaganda literature amongst the "heathen."

ALTHOUGH the Sheffield municipal authorities propose taking powers to acquire Coal Aston Aerodrome, it does not follow that it *will* be available for development of a municipal service, a possible development which has for several months been under consideration. From latest information to hand, it appears the aerodrome is to be re-opened as the headquarters of the 16th Group of the Royal Air Force. This group embraces an area covering Birmingham, Manchester, York, Liverpool, Shrewsbury, Nottingham, Derby, and Chester. Commandant G. W. P. Dawes, D.S.O., A.F.C., will have supervision of the area, having transferred his headquarters from Chester.

For the present the intention is not to station more than 100 men at the 'drome, or to open more than two or three of the numerous workshops *in situ*. So may be there will still be room for the commercial side of the aerodrome to materialise.

As an example of direct benefits possible from *The Times* Cape-Cairo exploration flight, a correspondent to our contemporary points out an air service should be able to fill, at least temporarily, a want the solution of which has for some time been under contemplation. The Uganda Administration has long desired to build a railway from Nimule to Mongalla and to link up with it the Busoga line. But the new line would have to traverse difficult country and would be expensive to build, so that hitherto funds have not been forthcoming.

Pending the realisation of this railway project, there is good reason for establishing a local air service between Mongalla and Jinja. From the one place to the other the journey at present is by a roundabout route, and takes, with all connections caught, on an average 12 days. It involves, first, a short railway section, then a steamer section (on Lake Kioga), next a 30-mile run by public motor, followed by another steamer stage (the steamers are of a very primitive kind), and, finally, from Nimule northwards a tramp of 100 miles on foot.

An aeroplane service would save all this delay and would more than repay its cost by the rapid transmission of mails and passengers. A good tourist traffic for it is also assured, and with it much increased revenue for the Sudan and Uganda. What is needed is an improved aerodrome at Mongalla, the transformation of the present emergency landing-ground at Nimule into a regular aerodrome, and the creation of a new landing-place in the 230-mile stretch between Nimule and Jinja. A suitable place for the new aerodrome would be at Masindi Port, where the Lake Kioga steamers stop running.

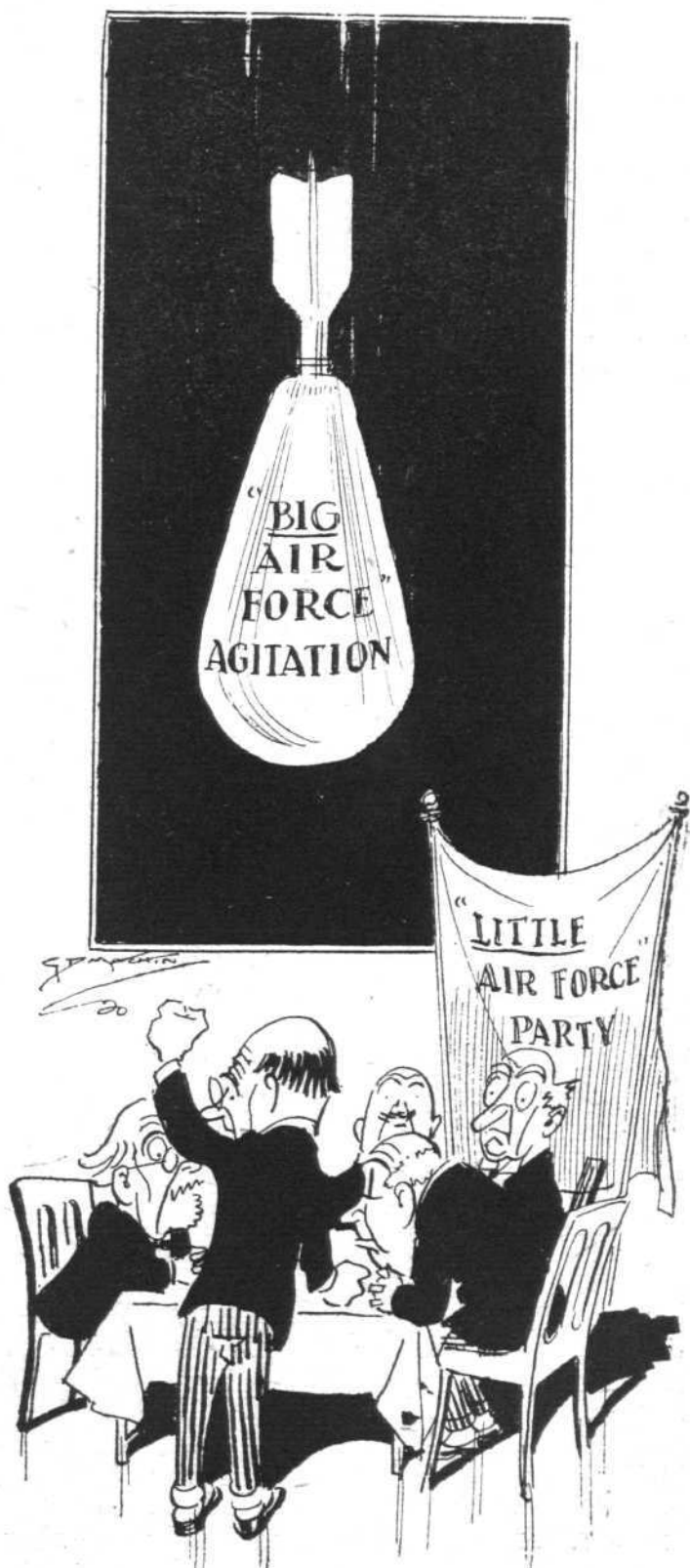
The aeroplane service outlined would serve the Albert Nyanza and attract traffic from the neighbouring goldmining region of the Belgian Congo. That it would be financially profitable no one who knows existing needs doubts.

REFERRING to the Government Aviation £64,000 Prize Competition, *The Times* states that the rules have now for the second time undergone revision, and in their latest form were generally approved at a representative meeting held last week, and have been passed for approval to the Air Ministry.

The chief objections raised in the past were directed against

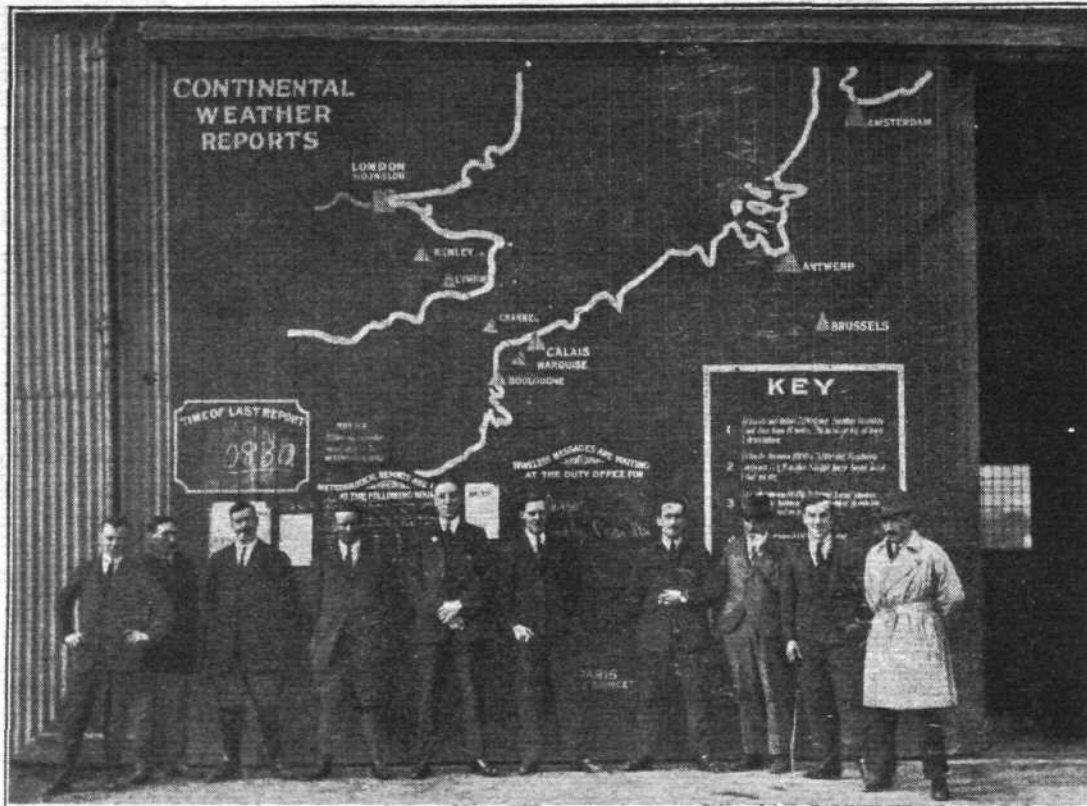
the rules that dealt with disqualification and marking and the classification of machines.

It is now recommended that competing aeroplanes instead of as heretofore being divided into two groups—those to carry two passengers and those to carry 15—should be classified so as to include those carrying from two to six in one group,

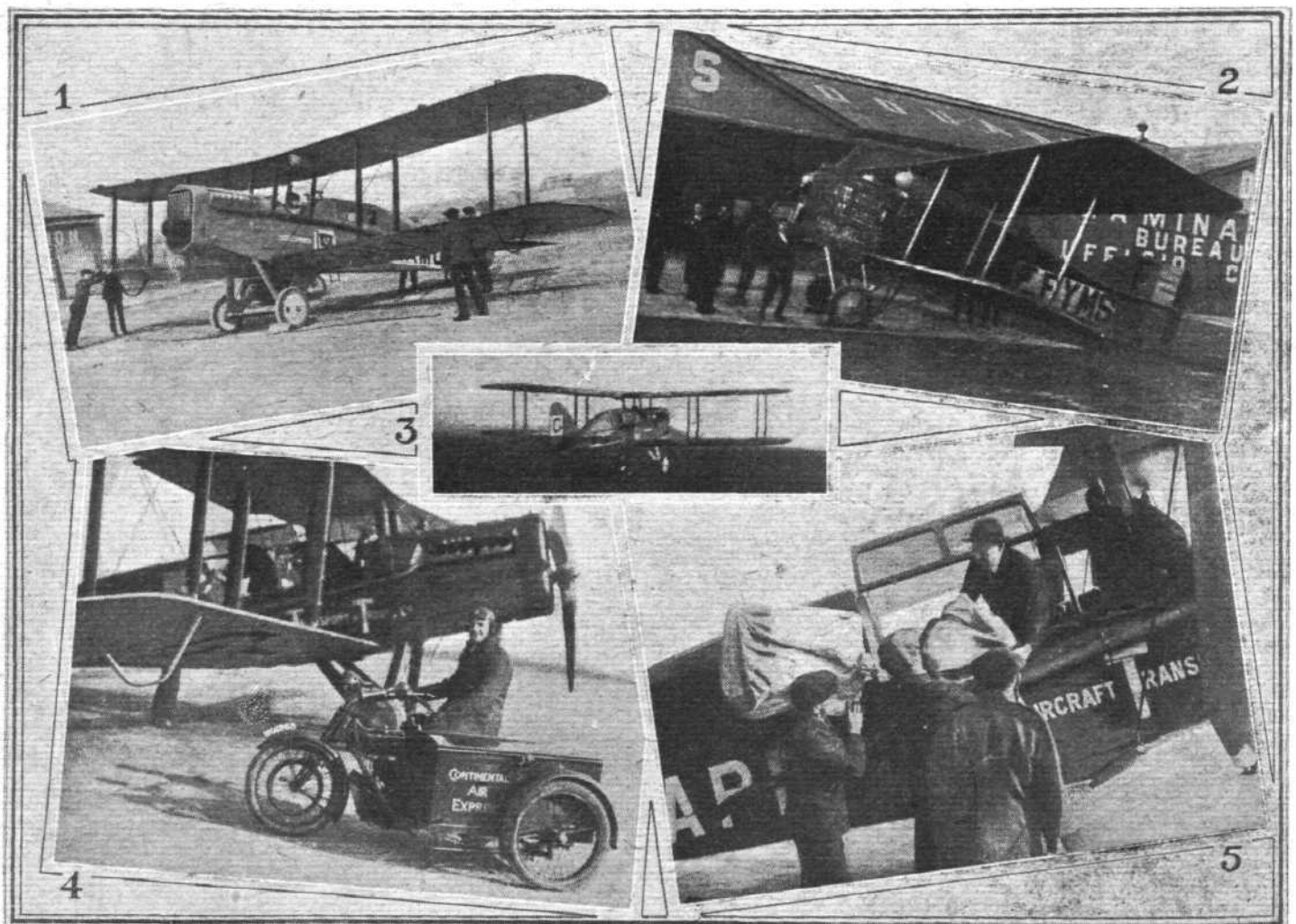


"Aeroplanes quelled the Mad Mullah's rebellion in Somaliland in three weeks."

Mop up the "Mad Mullahs" at home.

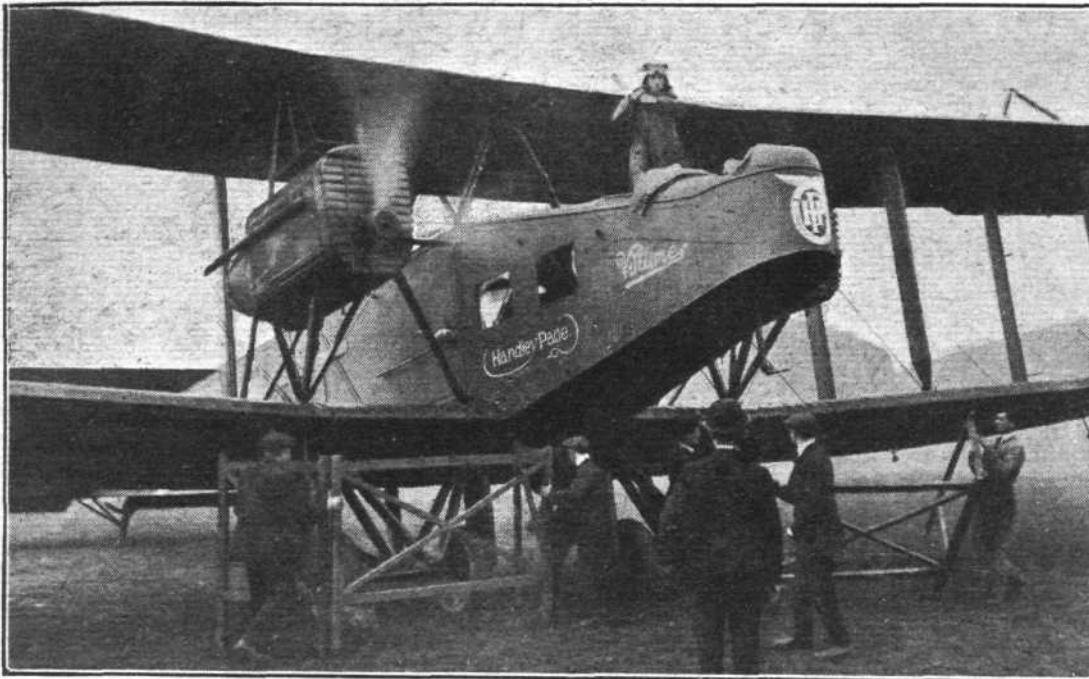


The Instone
London - Paris
Service : Some
of the Staff at
Hounslow and the
Weather Chart



"Flight" Copyright.

Messrs. S. Instone and Co., Ltd., and their new London-Paris service from Hounslow Aerodrome : 1, A D.H. 4 with Rolls-Royce engine ready to start for Paris ; 2, The French Breguet 'plane, also cleared for the Paris journey ; 3, The D.H. 4 gets away on its first public trip on February 18, this machine being scheduled to make two trips per week with parcels and passengers ; 4, The " mail " arrives per sidecar ; and 5, is loaded aboard the Aircro express 'bus



At Cricklewood Aerodrome: Officially inaugurated London-Paris Handley Page service. Ready to start. The mechanics removing the propeller-guards

"Flight" Copyright

and those carrying six and over six in the other. It is felt that with the original grading there would be strong encouragement for the production of "freak" machines, and that the revised system will dispose of that danger, a result all the more desirable when it is remembered that the object of the competition is to promote safer flying. Moreover, since taking part in it necessitates a considerable outlay on the part of the builder, it is very necessary that there should be every encouragement for the production of really sound and serviceable machines.

SIR ROSS SMITH, who carried out the London-Australia flight, testifies to the alertness of the Dutch to the advantages of aircraft. Speaking to the Institute of Journalists at Sydney the other day, he said that the Governor-General of the Dutch East Indies was prepared to give every encouragement and facility to any company prepared to start an aerial service between Australia and Great Britain.

IN Sir Ross Smith the Empire has a very practical missionary for keeping it in the front rank of aviation. Upon the same occasion, he congratulated the New South Wales

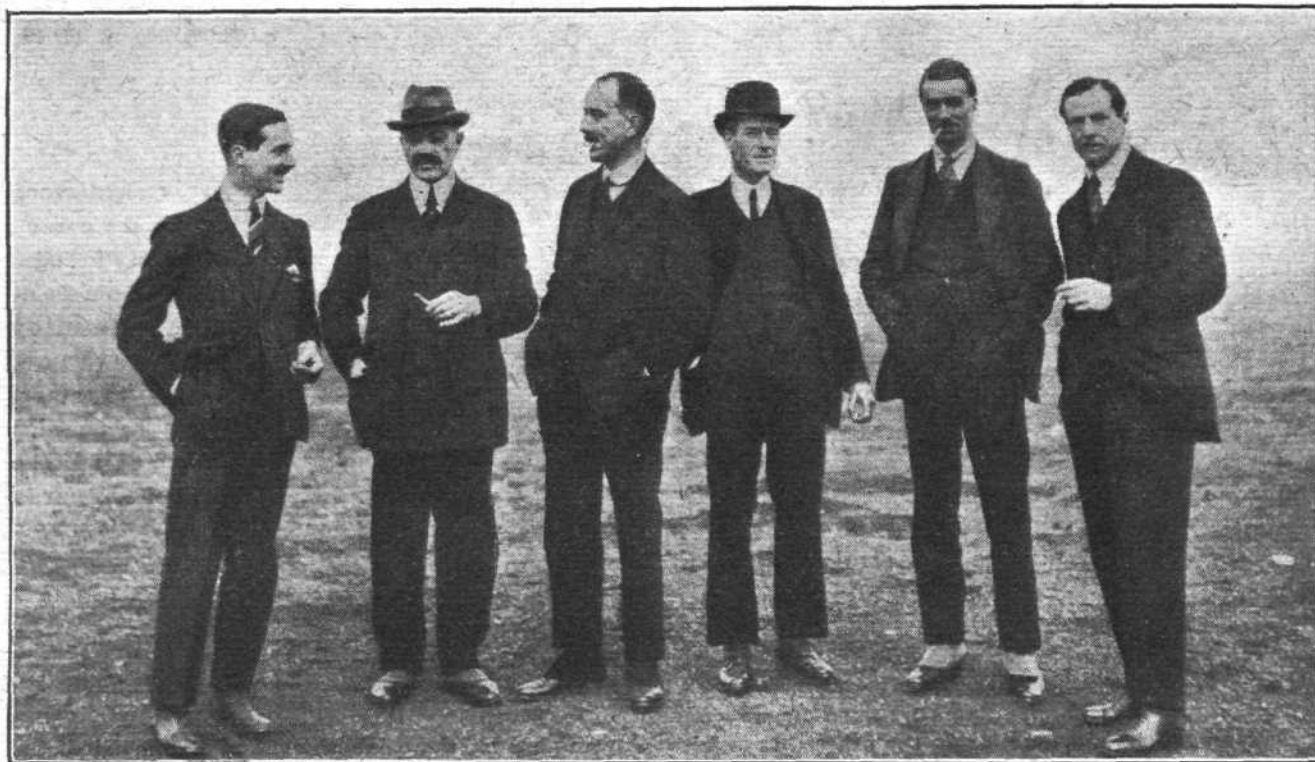
Government on the establishment at Richmond of the only State aviation school in Australia, and said that Germany, Japan, and other countries were taking big steps in the development of aviation, which would mean, of course, an important trade advantage. Australia must develop aviation for defence purposes, for the War had shown that the nation possessing the best air service was bound to win. An aerial fleet could carry torpedoes that would sink any sea fleet; thus aviation might well be the saviour of the Commonwealth. A squadron of aeroplanes could wipe out a squadron of invading battleships, and he implored Australians to insist upon having an adequate air fleet in the quickest possible time.

LOOKS as if, before long now, that big airship combination is likely to get going. Following elaborate and practical experiments, very costly in themselves, a big scheme to run regular Continental and Eastern services will ultimately, without much doubt, be put into shape.

APPARENTLY the Government have *not* received any information as to the destruction of the seven Zeppelins which should have been surrendered by Germany under the Peace

At Cricklewood Aerodrome: London-Paris Handley Page service. Unloading the freight from an H.P. on February 18 upon arrival at the aerodrome. Pilot Lieut. Beal on the extreme right





"Flight" Copyright.

AT CRICKLEWOOD AERODROME : Left to right : 1, Maj. Foot, H.P. chief pilot ; 2, Mr. Richard, H.P. foreign representative, just back from Poland ; 3, Maj. Bellairs, organiser of aerial post in Brazil, the 2,600-mile air-route ; 4, Mr. Fford, H.P. Indian manager ; 5, Maj. McLaren, who flew the first super-H.P. to India ; 6, Capt. Marr, original organiser of civilian flying at Cricklewood

Treaty. At least the Parliamentary answer to the query was "in the negative." All the same, it *may* reach them one of these days.

ON Thursday of last week an official American air service between Paris and Warsaw was inaugurated, Capt. C. H. Veil, an American pilot, having charge of the Breguet machine used for the initial journey. In the 10 hours' flight, which is the time calculated to be occupied between the two cities, Coblenz and Berlin will be called at for despatches and replenishments. This is all to the good of ambassadorial and commercial aviation, and we wish the highest success to the enterprise. But what seems quaint is that the service should be American. Surely the United States of America are still (nominally) at War with Germany? How will the occupants stand in case some over-zealous German pots or bags them during their trans-German journeying?

It is fitting that the daughter of such a pioneer in aviation as Maurice Farman should hold the palm for youthful piloting. Mlle. Andree Farman, although but 14 years of age, flew as long ago as 11 years. No; she was not the pilot *then*, but since last summer she has been flying with Farman *pere* under dual control pilotage, and has, moreover, it is announced, made an unaided distance flight of over three hours' duration. It only remains now for this demoiselle of the air to obtain formal pilotage recognition, when the F.A.I. rules permit her to be officially enrolled.

WONDER if that little four hundredweight aerolith, which "arrived" in France between Cambon and Fraisse-sur-Agout the other day, is a *billet doux* from Saturn or some other precocious planet, and that this is the form which their aerial "rocket" to us takes as the result of a few million years, more or less, of travel. Just fancy, if they are slinging messages at us in dots and dashes, and this is part of a dot which has managed to squeeze through space! Maybe their dashes take the form of the 100-tonner aerolith discovered away back by Peary in the Arctic, and which he successfully transported to America. In that case, if they get more aggressively scientific, they may invent some sort of mammoth Morse code in material form to attract our attention, and then—. Well, we'll leave it to the Spiritualistic crowd to tell us what may happen then. We'll save our efforts for scraping together the wherewithal to satisfy the call of the Chancellor of the Exchequer when he sends out *his* message of Love to the citizens of this little island. Most of us, with

ever and ever narrowing incomes plus soaring prices, are feeling that we don't care a dash if we do get dotted by an aerolite or any other old rocket.

In past issues reference has been made to the part played by aeroplanes in connection with the much discussed Amritsar disturbances. The other day was issued the Punjab Government's report on these riots, and therein this part of the suppression tactics is dealt with as follows:—

"The disorder at Gujranwala was of a serious type; it led to a widespread destruction of Government property; and had there been a scattered European community such as that at Amritsar it might have led to outrages such as those which occurred in that city on April 10. . . . Part of the crowd invaded the railway station and stoned the passenger train proceeding to Wazirabad. Part of the mob then set on fire a small railway bridge opposite the Gurukul.

The police fired on the crowd whenever it got within reach, but it scattered on their approach, and apparently few were wounded. Meanwhile a further section of the crowd found its way to the now unprotected railway station and set the building on fire; another party set fire to the goods shed, and what property was not burnt was pillaged by the bad characters who had collected on the spot. The Casson Industrial School was also gutted.

"At this juncture three aeroplanes, despatched from Lahore, arrived. Only one of them dropped bombs. One bomb fell through the roof of a house and failed to explode; one fell among a party, killing one woman and one boy, and slightly wounding two men. Another bomb dropped into a dry pond and did not explode. At 3.35 the officer attacked a crowd of some size near the Khalsa High School and boarding house on the outskirts of the town; one bomb was dropped and 30 rounds fired from the machine gun. At 3.40 p.m. two bombs were dropped near a mosque in the town; these failed to explode. The aeroplane was now directly over the scene of the worst of the disorder. One hundred and fifty rounds were fired from the machine gun at crowds in the street; one bomb was dropped on the crowd near the burning goods shed, killing four and wounding five men; one bomb was dropped on the crowd in front of the station, killing two men and wounding six. A second aeroplane, which arrived at 3.25 p.m., fired in all 700 rounds, but dropped no bomb. The third aeroplane neither dropped bombs nor fired its machine gun. As far as has been ascertained, the total number of persons killed by the police was three, and by the aeroplanes nine; 27 in all were wounded by police and aeroplane."

EDUCATION AND RESEARCH IN AERONAUTICS

THE Report of the Committee on Education and Research in Aeronautics addressed to the Rt. Hon. Winston S. Churchill, M.P., Secretary of State for Air and dated December 12, 1919, was issued as a White Paper last week. The Report which is signed by Sir R. T. Glazebrook, K.C.B., D.Sc., F.R.S. (Chairman); Sir Alfred Keogh, G.C.B., G.C.V.O., C.H., Imperial College of Science and Technology; Sir H. Frank Heath, K.C.B., Scientific and Industrial Research Department; Sir Francis G. Ogilvie, C.B., LL.D., The Science Museum; Mr. F. Handley Page, C.B.E., Handley Page Ltd.; Mr. G. Holt Thomas, Aircraft Manufacturing Co., Ltd.; Professor J. E. Petavel, D.Sc., F.R.S., National Physical Laboratory; Lieut.-Col. H. T. Tizard, A.F.C., and Mr. J. G. Gibson (Secretary), is as follows:—

1. The Committee on Education and Research in Aeronautics was appointed originally by Lord Weir of Eastwood, in October, 1918, under the following terms of reference:—

"To consider what steps should now be taken to organise education and research in aeronautics after the war, and to report."

"The Committee should have regard to the agencies which already exist for this purpose, or which it is proposed to establish, and in particular the relationship of the Zaharoff Professorship to such agencies."

At a later date, after learning the views of the Committee, the Government came to certain conclusions with regard to the matters under consideration, and the Committee was requested, in November, 1919—

"To consider and report with reference to the decisions of the Government as to Aeronautical Research, Education, etc., and to submit recommendations."

In accordance with this reference the Committee proceeded to consider what steps should now be taken to organise education and research in aeronautics in view of the decisions referred to above, of which the main features are as follows:—

(a) The responsibility for research and experimental work undertaken for the development of aeronautics with money provided by the Government will be shared by the Department of Scientific and Industrial Research and the Air Council. To assist the Air Council in their work an Aeronautical Research Committee is to be constituted in substitution for the present Advisory Committee for Aeronautics. The exact composition and functions of this Committee have not yet been decided.

(b) The assistance to be given by the Department of Scientific and Industrial Research to research and experimental work in aeronautics is to be on the same lines as that given in other industries, i.e., if the aeronautical industry desires at any time to form a research association for the purpose of conducting research into some special phase of aeronautics, the Department has authority, after consulting the Air Council with a view to preventing overlapping of work, to finance such an association for the purpose.

(c) The main part of the financial assistance to be given by the Government to the study of aeronautics will, in view of the foundation of the Zaharoff Chair of Aviation at the Imperial College of Science and Technology, be given to that College, but application for assistance from other Universities in future, should they require it, will also receive consideration.

Taking these decisions into account, and considering the question in all its aspects, the Committee has come to the conclusions set forth in the following Report:—

Introduction

2. The Government have now decided how provision is to be made for research in aeronautics. We desire, at the outset, to emphasise the necessity for that research.

The Department of Scientific and Industrial Research is to continue the provision for fundamental research at the National Physical Laboratory, and to assist the Aeronautical Industry in the same manner as other industries, by taking part, when desired, in the formation of a Research Association. In our view, at the start of a new industry, something more is required. At the present moment the industry is passing through a crisis; Government support is necessary if it is to emerge satisfactorily.

The time is critical and the development of civil aviation is beset by numerous difficulties and calls for the fullest consideration. It is urgently necessary that the policy adopted should command the support of all who desire to maintain the superiority in the air gained during the past eventful years, and that ample funds should be provided for carrying it into effect.

3. A difficulty which arises in the case of a new industry of this kind lies in the fact that the scope of the work is inadequate to maintain automatically a sufficient number of experts in design and production.

A research organisation may elucidate problems, provide general information and specific facts, but before these can bear fruit of industrial value they must be interpreted and applied by a suitable technical staff, closely associated with the works organisation. At the end of the War most of the works had collected a team of technical experts of marked ability; many of these teams have now been disbanded and further disintegration is in progress. We see no possibility of achieving the desired result except by such Government action as will secure the retention of adequate technical staffs.

4. During the War this country obtained the lead in aeronautical research; it would be lamentable to see the fruits of the work pass from a paralysed industry to better supported foreign competitors. In the later sections of our Report we recommend the establishment of an organisation for Aeronautical Research to assist the Air Council, and, in our view, it is important that the work of that organisation should be available, in great measure, for the assistance of the industry, and the advance of civil aviation, as well as for the Services. Should an Industrial Research Association be formed, it should be linked up with the organisation we recommend.

5. Education and research are clearly very closely interrelated. The education with which we have chiefly concerned ourselves is that suitable for aeronautical engineers and constructors, that is to say, post-graduate work for which the students will be fitted by a previous undergraduate course of either mechanical or general engineering training at one of the Universities or technical colleges. We have not dealt with the training of pilots or of mechanics. The course we contemplate will comprise a special study of the following matters:—Aerodynamics—the laws of motion of bodies moving in the air, illustrated by experiments and researches in wind channels; the principles of design and construction; engines and the methods of propulsion of aircraft; the investigation of instruments used in flight, with problems in meteorology and navigation. The engineer must also gain the practical knowledge acquired only in the workshop, and must have experience of the full scale researches necessary to test and verify his theoretical conclusion. Such a course might eventually involve one or more centres of theoretical instruction with experimental aerodromes and laboratories where the full scale problems may be worked out, but as the number of persons likely to require this higher post-graduate education will not be great, we consider that it will be wise for the present to concentrate the work in one central institution with which the experimental aerodromes should be closely connected. Such a central institution we find in the Imperial College of Science and Technology at which the professorship lately founded by Sir Basil Zaharoff, G.B.E., is to be held.

6. To turn now to research: this is the means by which advance in aero-

nautics is possible and it is required by all interested in the progress of the subject; by the State, whether for the purposes of defence or to enable it to lay down the rules necessary for the safety of aircraft when used for civil purposes; by the Professor whose aim is to increase knowledge, and by the industry in order that they may maintain the superiority which British aircraft has already achieved. Research is difficult, its requirements are costly, and the men who can undertake it are few. To establish separate laboratories and aerodromes for each of these special interests is for the moment out of the question; here again combination is called for; combination too with the agencies concerned in education. At the same time we recognise fully that special problems may be dealt with at other research centres, and we trust that every encouragement may be given to these for such work.

7. Since the commencement of practical aeronautics, research has been directed by the Advisory Committee for Aeronautics, a body under the presidency of the late Lord Rayleigh appointed by the Prime Minister in the year 1909, for the superintendence of the investigations at the National Physical Laboratory and for general advice on the scientific problems arising in connection with the work of the Admiralty and War Office in aerial construction and navigation."

8. Full scale research has been carried out at Farnborough in part at the initiation of the Advisory Committee, in part at that of the military authorities; the Committee, however, have no control over the work there and only occupy an advisory position with regard to it. During the War other centres of full scale research were established, e.g., the Isle of Grain and Felixstowe for seaplanes, Kingsnorth and Pulham for airships, and the Advisory Committee has been kept in close touch with the work in progress at all of these. Its activities have been of the greatest value. In our view a central co-ordinating body of this kind is essential, and it is now proposed to establish an Aeronautical Research Committee to which the duties of the Advisory Committee would be transferred, and to which would be added certain duties and responsibilities with regard both to the central research aerodromes and to education. The proposed Committee should be in a position to supervise effectively such work as comes within its purview.

9. The work in aeronautics conducted at the National Physical Laboratory would also, usually, be undertaken on the initiation of the Committee, the expenditure for such work forming part of the budget of the Department of Scientific and Industrial Research.

10. In order to connect the Committee with the educational work and to render the opportunities of research at Farnborough and elsewhere available both to teachers and to students, we suggest that arrangements should be made between the Committee and the Imperial College for dealing with matters with which they are jointly concerned. In this connection, moreover, we suggest that it would be possible in a number of cases for members of the Research Staff to act as Professors or Lecturers at the College.

The scheme outlined above, which we proceed to develop more completely, agrees in the main with that put forward in the reports of the Civil Aerial Transport Committee (Cd. 9218) and described in the reports of Special Committee No. 5, and we consider that it may be possible through the organisation outlined to link up the advanced teaching in aeronautics wherever given. It is, in our opinion, highly desirable and indeed essential that any teaching connected with aeronautics which may be given elsewhere should be related and co-ordinated with this organisation.

We would add that the reports of Special Committee No. 5 of the Civil Aerial Transport Committee have been of the greatest value to us.

Education in Aeronautics

11. Education in aeronautics in its widest sense might be held to cover not only the education of the scientifically trained engineer, designer, or constructor, but also that of the mechanic or artisan. We have not, however, thought that the education of the latter class fell within our terms of reference. It will in the main be provided by the formation of special classes at the principal technical schools, more especially at those situated in the neighbourhood of important works or aerodromes.

12. The problem of the organisation of education in aeronautics as it has presented itself to us has been that of higher education, which can only be given in institutions of university rank.

The subject-matter of this higher education comprises instruction in—

I. Aerodynamics (full scale and model work)—(a) Aeroplanes; (b) Seaplanes; (c) Airships and kite balloons. II. Engines and the means of propulsion. III. Principles of design. Structure and material. IV. Instruments, meteorology and navigation.

13. We consider that an undergraduate course in engineering such as is commonly provided at universities and at the great technical schools forms the necessary preparation to any more specialised course of instruction.

The advent of aeronautics will doubtless to some extent be reflected in the curricula of existing undergraduate courses. Just as at present the education of a mechanical engineer is incomplete without some general knowledge of electrical engineering, so in future all engineers should have at least an elementary knowledge of aeronautical engineering. For the civil engineer it will, for example, offer some instructive instances in the study of structural design, while some reference to aeronautical engines will necessarily form part of any mechanical engineering course. Existing courses do not, however, provide for the specialised training which is needed for those who are to direct aeronautical research, and the design and construction of aircraft. It is clear that the provision of such training is of vital importance to the future of aeronautics whether viewed from the industrial and civil standpoint or from the point of view of defence.

14. The organisation of this higher training requires in our view the provision—

(a) Of courses for men who have attained the highest standards of university training at the various engineering schools;

(b) Of courses based on a sound general engineering training but not involving too high a standard of mathematical knowledge for men of special practical ability.

The first class is represented by honours graduates, i.e., by the pick of those who have passed through undergraduate courses.

We contemplate that the period of special theoretical training should not exceed 12 months, distributed as might be convenient over the ordinary period required for practical training.

During the period of post-graduate instruction the student should also obtain some air experience. We have not, however, thought it within the scope of our enquiry to deal with the question of the provision of instruction in flying, though it is, we think, important that it should be recognised as a desirable part of the technical equipment of the designer and constructor.

We have not thought it necessary to work out in detail the curricula of the higher education, nor to discuss the administrative arrangements which will be required to provide for the division of the student's time between the lecture courses and the practical work in research stations or in the shops.

15. It is undesirable that promising students of small means should be deterred from higher education in aeronautics by the expense which a prolonged period of training involves. An adequate system of maintenance

scholarships should be established. This might be supplemented by the payment of small salaries in respect of periods passed in the research establishments or in aircraft works.

Organisation of the Higher Education in Aeronautics.

16. The specialised or post-graduate training of the kind which has been described in the previous paragraphs should, in our view, be organised on an entirely different basis from the undergraduate training. The latter, as we have shown, can and should be provided in existing organisations of University rank in various parts of the country. Post-graduate training, however, to be complete, requires access to aerodromes and to research stations fitted with technical equipment, and it would be, we think, impracticable under present conditions to try to provide completely for this highly specialised training at more than one centre.

The financial saving through the avoidance of duplication of research and other facilities necessary to the higher grades of education is obvious. It is also relevant that whatever the future developments of air transport may be, the number of posts for which men of the higher standard of training are required will be limited; and that men possessing the combination of theoretical aptitude and practical ability needed to profit by the highest kind of professional training are not numerous. Before the War the total yearly number of honours graduates in engineering, including civil, mechanical, electrical engineering and naval architecture, from all the Universities in the United Kingdom was not high, and only a fraction of the future number are likely to devote themselves entirely to aeronautics.*

17. In connection, however, with the question both of undergraduate and post-graduate education, we would remark that the demands for the courses provided must depend considerably on the policy of the Government for the filling of such higher technical appointments as may be required by the Air Force or by the Air Ministry, or whatever Department becomes responsible for the regulation of civil aviation. If technical appointments are thrown open to competition among graduates (as is done, for example, with the medical branches of the Naval and Military Services) the demands for the training provided in the University courses will be greater than if the State itself trains youths selected at an early age.

18. The Zaharoff Professorship of Aviation supplies the nucleus of the single organisation which we think is desirable for the direction of higher education in aeronautics. This Professorship was established as the result of a benefaction to the British Government by Sir Basil Zaharoff, G.B.E., and it has been arranged between the parties concerned that it should be established as a Professorship of the University of London and held at the Imperial College.

In our opinion the Imperial College should become the central school for advanced study in aeronautical science, and we have, in the later sections of the report, described an organisation for teaching and research whereby this might be secured.

19. It is clear that it would exceed the powers or abilities of any single teacher to cover all or many of the various fields of knowledge which are comprised under the general term of aeronautics. The appointment of additional teachers and the organisation of the Department of Aeronautics should be effected with the fullest regard to the resources which the Imperial College already possesses for providing instruction in interdependent subjects such as physics, mathematics and engineering.

20. The teaching personnel of the actual Department of Aeronautics should, we think, comprise professors or lecturers qualified to provide advanced instruction as regards aeroplanes, seaplanes, airships, and kite-balloons in the following subjects: (1) aerodynamics, i.e., the laws of motion of bodies moving in the air, (2) aero-engines and methods of propulsion, (3) design, including structure and materials in so far as these could not be treated apart from the principle of design of aircraft in the engineering and other departments of the college, (4) meteorology, instruments and navigation.

21. We consider that it is of importance that the same staff should to a great extent deal with both education and research, including much of the research directly required by the Government as well as that directed more especially to the advancement of the theory of flight. The expense involved in aeronautical research and the limited number of men competent to undertake it both lead to this result, which is in our view in itself desirable. We discuss this question in greater detail in Sections 49-52 of our Report.

Research in Aeronautics

22. The establishments which will be required to provide the facilities for the different aspects of research in aeronautics fall under five divisions:— (1) Model research; (2) full scale research; (3) testing and experimental investigation; (4) special investigations connected with airships and kite-balloons; (5) navigation and meteorology.

Model Research

23. This includes model work in connection with aeroplanes, with seaplanes and with airships (rigid and non-rigid airships and kite-balloons). The model research work under these heads is at present carried on at the National Physical Laboratory and also to some extent at the Royal Aircraft Establishment.

The fact that under the arrangements we propose research work at the National Physical Laboratory and the Full Scale Research Establishments will be undertaken in co-operation with the Aeronautical Research Committee should remove any lack of touch which might exist between those responsible for model work and those conducting full scale investigation. The National Physical Laboratory also contains facilities for research in allied sciences.

Full Scale Research and Experimental Investigation.

24. This work comprises research undertaken to investigate general principles and laws, and is at present mainly represented by the experimental side of the Royal Aircraft Establishment. During the War full scale research on seaplanes was mainly conducted by the Technical Department of the Air Ministry at the Isle of Grain and at Felixstowe, that on airships by the Admiralty at Kingsnorth and Pulham, while kite-balloons were investigated at Roehampton.

The Royal Aircraft Establishment and the aerodrome attaching to it are Government property, and it appears to us that suitable provision might be made either there or possibly at some other aerodrome near London for the full scale work which is essential to our scheme. Adequate facilities for the scheme already exist at Farnborough along with other facilities for production work. We therefore recommend that such portions of the establishment

* Vide paragraph 24 of the Final Report of Special Committee No. 5 of the Civil Aerial Transport Committee:—"As outlined above, the specialised training of the aeronautical engineer would be a post-graduate course, and the question arises as to the nature of the institutions at which such courses should be organised. It has already been pointed out that, whatever the development of the industry may be, the number of posts suitable for men of the highest standard of training is necessarily limited, and it is equally obvious that men possessing the combination of theoretical aptitude and practical ability required to profit by such a training are not numerous. Before the War, the total yearly number of honours graduates in engineering, including civil, mechanical, electrical engineering, and naval architecture, etc., from all the universities in the United Kingdom averaged about 200.

as are required for our purpose should be made available for researches, under the supervision of the organisation described in the Report.

Under such an organisation the research work at the Royal Aircraft Establishment should, we suggest, come under the following heads:—

(a) Experimental work for the advancement of aeronautics generally. The results should have open scientific publication, and participation in the experimental work should be among the educational facilities available at the establishment; (b) specific experimental work undertaken at the request of a Government department. The publication of the results of the work would be a matter for the Government to decide; (c) certain specific experimental and testing work on payment for the industry.

The establishment at Farnborough could not, of course, meet completely the need for full scale research and experiment on seaplanes and on airships, much of which must continue to be carried out elsewhere. But while this is so, there are many problems common to all kinds of aircraft which could be dealt with at Farnborough.

Special Investigations connected with Airships and Kite-balloons

25. Full scale work on airships has been mainly carried on at Pulham Air Station, while kite-balloons have been dealt with at Roehampton, the model work, as in the case of aeroplanes and seaplanes, having been mainly done at the National Physical Laboratory. Here again arrangements must continue for full scale work to be carried on at some station possessing suitable facilities. Arrangements could, no doubt, be made for such investigations to go on under the supervision of the research organisation.

Navigation and Meteorology

26. The administration of the Meteorological Office has recently been placed under the Air Council, and we are glad to learn that the revision of the arrangements for the meteorological services which has now been carried through will be to the advantage of aviation, not only in respect of the collection and dissemination of meteorological information, but also in the furtherance of meteorological research.

The study of navigational problems, it may be remarked, has not been developed by the War to the same extent as some other aspects of air technology. The increasing range of air travel serves to emphasise the need for the fullest development of experiment in these directions, and the introduction of aerial transport on a civil basis will greatly enlarge the demand upon both practical and theoretical meteorology.

Testing and Experimental Investigation

27. This class of work, as apart from that referred to in Section 24, is at present represented by Martlesham Heath. It includes the determination of the performance of machines; tests of the efficiency of particular engines, and of minor modifications of machines and engines as affecting efficiency. This class of work may also include testing of typical machines to conformity with specification, as well as strength testing to destruction. A station of this character is required in view of the provisions of the Air Navigation Act.

Interests concerned in Research

28. We now turn to an enumeration of the different interests concerned in the conduct of aeronautical research—in varying degrees, but in all cases to a sufficient extent to require some voice in its control. They are (a) the State as responsible for the maintenance of the armed forces of the Crown by land, sea, and air; (b) the aircraft industry as constructors and as operators; (c) education—and in particular the organisations providing higher education and (d) the State as the regulating authority for civil aerial transport.

Military Interests of the State

29. The scope of the State's responsibilities will be based on the future requirements of national defence, and it is probable that the aerial defence of the country will not be less important than naval and military defence of sea and land. Under present conditions, however, there is nothing to suggest any basis of expenditure on fighting aircraft either absolute or in proportion to expenditure on the Navy and Army.

30. We desire, however, to refer to one factor which seems to us of the first importance in the determination of the State's responsibilities as regards provision for research. In the pre-war Naval Estimates between one-third and one-half of the total vote was allocated to new construction, research and experimental work forming only a small incidental item. The larger naval units take a number of years to build. For that reason only a relatively small increase of effective construction can be brought about after a declaration of war; and supremacy, other things being equal, would be decided by the number and quality of the units available at the outbreak of hostilities. In the case of aircraft, however, the experience of the present war has been that a given type is becoming obsolete by the time that it is in general use. This applies essentially to the fighting scout machines, in a lesser degree to other types, and least of all to airships.

Regard must also be had to the high rate of wastage of aircraft under war conditions. There is, moreover, the liability of machines kept in store to become unfit for use, which makes it difficult (apart from financial considerations) to maintain a large peace reserve of machines.

The final supremacy in the air in any future war will thus depend not mainly on the number of units available at the outbreak of hostilities, but on the adequacy of the preparation made beforehand for the rapid construction of the newest and best types.

31. This preparation, so far as it might take the form of administrative arrangements for the maintenance of equipment for large emergency production, is not within the terms of our reference, but it is clear that such preparation must in any event imply the ordered availability of (a) general scientific knowledge accumulated by systematic research, (b) detailed information with regard to all available types, (c) a liberal construction (not necessarily by the State itself) of experimental machines.

It is relevant also to observe, in connection with the organisation both of research and education, that any emergency expansion of production which might be required by a future war must be directed by a body of technical experts who could not be improvised after the emergency had arisen.

The Aircraft Industry as Constructors and as Operators.

32. Economic and Imperial considerations alike emphasise the importance of securing that the aircraft industry of this country should be so organised as to maintain a supremacy against all competitors from other countries, and it is obvious that generous provision for scientific research is necessary for the efficiency of an industry so highly technical and scientific as that of aircraft construction.

It is, however, improbable that individual firms of designers or constructors could provide themselves with the research facilities which will be required. This is clear both from considerations of expense and of the insufficiency of men competent to undertake research work. The conduct of research on an individualistic basis, even if it were otherwise practicable, would involve a great deal of overlapping, and though it might enable individual firms to compete with each other, would not necessarily or even probably secure that their scientific resources would be organised in the best way to meet competition in international markets.

33. The formation of an Industrial Research Association, which is under consideration, implies a recognition of these facts. Such an organisation, which should embrace within its membership all the leading firms of aircraft

constructors, is, in our view, essential to the conduct of research in the industrial aspect.

Education.

34. Access to research facilities is required (a) to enable the Imperial College to discharge its responsibilities for higher education in aeronautics and allied branches of knowledge, and (b) for the furtherance of knowledge as an end in itself and without reference to any immediate needs, whether of the State or of the industry. It is not necessary for us to labour the importance of adequate provision for independent research of this kind, but we desire to make clear our opinion that it is essential to the progress of knowledge in aeronautical and the allied sciences. During the war purely theoretical investigations have inevitably been subordinated to those undertaken for war requirements. It is important that under peace conditions disinterested research should have proper scope.

The State as Regulating Authority of Civil Transport.

35. It appears from the terms of the Air Navigation Act that the State as a regulating authority has powers, *inter alia*, to test and pronounce upon the airworthiness of machines in use for public purposes (that is to say, for carrying for hire or for the transport of mails). These functions imply the laying down of conditions of strength, performance, and air endurance, and it is necessary that the department exercising them should have access to research facilities.

Common use of Research Establishments by the various Interests.

36. From the foregoing paragraphs the conclusion has been reached that four different interests, each in its degree, require access to establishments where the types of research mentioned in Sections 22-26 are carried out, *i.e.*, (1) Model research, (2) Full scale research, (3) Testing investigation, (4) Navigational and meteorological research.

37. We are of opinion that so far as possible the research facilities should be organised on the basis of a common use of the same establishments by the various interests.

We are led to this conclusion, as we have already remarked, by the need of conserving and utilising to the fullest degree the resources both in staff and equipment engaged in aeronautical research, and also by the fact that very great and, as it seems to us, unnecessary expenditure would be involved by any present duplication of research establishments.

The expenditure required for the provision and maintenance of the various establishments will be very considerable. A Model Research Establishment involves the provision of wind channels and laboratory equipment. Full scale research implies unfettered access to a completely equipped aerodrome with large engineering workshop facilities. The same applies to testing work. Navigational and meteorological research, too, cannot be efficiently maintained without expenditure on a liberal scale.

Limitation of the number of establishments is imposed not only by the desirability of avoiding a dissipation of effort, but also by the comparatively small number of persons who are at present qualified to direct the higher branches of education and research in aeronautics.

38. The principle of a common organisation of research stations is, however, subject to certain qualifications.

(a) Many researches of exclusively naval and military concern (such as, for example, armament research) must no doubt to a considerable extent continue to be carried on at service stations by service personnel, though assistance in particular problems should be available from the various establishments for research in aeronautics and in other allied branches of knowledge.

(b) It will be necessary to provide that the use of common facilities does not of itself imply the complete pooling of results. (i) This must necessarily apply as regards confidential investigations undertaken for Government purposes; (ii) it may also be found desirable to make arrangements whereby individual firms of aircraft constructors will be able to have industrial experiments carried out for their private information. The arrangements under which this will be done should be settled between any Research Organisation set up and the Industrial Research Association as representative of the industry.

(c) We think it is of importance to encourage decentralisation of research on aeronautical problems which do not demand elaborate equipment or involve actual flying. There are many branches of research of the first degree of interest which do not involve access to aerodromes or to elaborate aeronautical equipment, and which can, therefore, be carried on in other institutions. These include, for example, the study of raw materials (timber and fabrics), strength, investigations of parts of structures, improvements in fuels, engine investigations, the chemistry of dopes, and mathematical investigations of all kinds.

Control of Research Facilities.

39. The maintenance of a common use of the same research facilities by the various interests concerned depends on the contrivance of a form of control of these facilities which will command the confidence of all parties. We have come to the conclusion that it will be necessary for this purpose to set up a Research Organisation representative of the various interests, including the industry and the Teaching Authority.

We recommend that this organisation should take the form of an Aeronautical Research Committee, reporting to the Air Ministry. The Committee would supervise such research work for the Government as might be placed in its charge, and initiate such work as it thought advisable. Any work undertaken for the Committee at the central stations of the Ministry would naturally be carried out with the concurrence of the Director of Research. The Committee would also administer the funds made available by the Air Council for its work, and keep in close touch with the trade and educational authorities, as well as with other Government departments concerned.

Constitution of the Aeronautical Research Committee

40. The Aeronautical Research Committee should include representation of—

(a) The department or departments responsible for (i) naval and military aeronautics, (ii) the regulation of civil aerial transport; (b) the Department of Scientific and Industrial Research, including direct representation of the National Physical Laboratory; (c) the aircraft industry; (d) the Imperial College; as well as (e) other members of scientific attainments.

The chairman of the Committee should be a scientist of eminence, and in a position independent of the Government departments represented on the Committee.

He and the other non-official members of the Committee should receive suitable remuneration.

Functions of the Aeronautical Research Committee

41. It should be the duty of the Aeronautical Research Committee to devote itself to the advance of aeronautical science, and, with this object, in particular—

(1) To advise on scientific and technical problems relating to the construction and navigation of aircraft; (2) to undertake or supervise such research or experimental work as is proposed to the Committee by the Air Ministry, and to initiate any research work which the Committee considers to be advisable; to carry out such work itself or to recommend by whom the work should be carried out; (3) to take over complete responsibility for the Air Inventions Committee and for the Accidents Committee; (4) to promote education in aeronautics by co-operating with the Governors of the

Imperial College; (5) to assist the aeronautical industry of the country by scientific advice and research, and to co-operate with any Research Association that may be established; (6) to prepare for the approval of the Air Council a scheme of work and estimate of expenditure for the year, and to administer the funds placed at its disposal by the Air Council; (7) to make reports from time to time to the Air Council.

Aeronautical Research Committee to replace Advisory Committee

42. We propose that the Aeronautical Research Committee should replace the present Advisory Committee for Aeronautics, discharging in the main the functions of that body. On this point it is desirable to refer briefly to the present functions of the Advisory Committee.

43. The Committee was originally appointed to advise the Prime Minister, as Chairman of the Imperial Defence Committee, to determine what problems should be studied, and by what methods, and to discuss and offer advice on his solutions. It was the duty of the Committee to superintend the investigations at the National Physical Laboratory, and to advise generally on the scientific problems arising in connection with the work of the Admiralty and War Office in aerial construction and navigation.

Since the inception of the Air Ministry the Committee has reported to the Secretary of State for Air instead of to the Prime Minister, its duties remaining unaltered. The Air Ministry, Admiralty, and War Office were represented on the Committee by officers of high standing, and this close association proved of great value in securing co-ordination of research.

44. The work of the Advisory Committee for Aeronautics is ordinarily carried out through a number of standing sub-committees. These sub-committees submit monthly programmes of work to the main committee, and the results of all the approved investigations are in the first place reported to and discussed by the sub-committees.

45. It should be added that the executive control of the staff responsible for carrying out investigations at the National Physical Laboratory rests not with the Advisory Committee but with the Executive Committee of the Laboratory which undertakes to carry them out in accordance with the wishes and advice of the Advisory Committee. The fact that the chairman of the Advisory Committee also filled the post of Director of the Laboratory facilitated this arrangement.

46. It will clearly be necessary that the Aeronautical Research Committee should have power to appoint sub-committees, membership of which should not be restricted to members of the Committee itself. It has been the practice in the past, when appointing such sub-committees, to include in their membership representatives of the actual workers engaged in the fields of work under consideration. This practice has been found to be of very great value.

Financial and Administrative Arrangements

47. In accordance with the decision of the Government, the responsibility for research and experimental work undertaken for the development of aeronautics with money provided by the Government will be shared by the Department of Scientific and Industrial Research and the Air Council.

The Air Council will be responsible generally for work financed directly from funds at their disposal, while the assistance given by the Department of Scientific and Industrial Research will be on lines similar to those applicable in the case of other industries, *i.e.*, by the formation of a Research Association. The department will also continue to be responsible for the funds required for the work at the National Physical Laboratory.

Where the Aeronautical Research Committee finds it desirable to arrange for specific research or experimental work to be carried out by individual research workers other than those engaged in the central establishments, the necessary arrangements should be made in consultation with the Department of Scientific and Industrial Research, which is responsible for the main State provision for the assistance of research conducted under such conditions.

48. We would urge the importance of the financial arrangements of the Aeronautical Research Committee being put on a basis which will allow an adequate freedom in the allocation of expenditure within the limits of the total sum available.

Co-ordination of the Research and Educational Organisation.

49. We have referred earlier in this Report (Section 14) to the need for close association between the research and experimental work and the strictly academic portion of the higher education. No school for providing this education can be successful unless the students are brought into direct touch with practical problems during their tuition, and unless those engaged in teaching are also engaged in or directing scientific research or experimental design.

50. The arrangements whereby the student will divide this period of post-graduate instruction between work on books and at lectures and practical work at research stations, to which we have already referred, should apply also in regard to the duties of the teaching staff. These should be such as to enable a professor or lecturer to spend part of his time in giving instruction at the Imperial College, while giving the rest to investigations at one of the research centres.

51. As stated in Section 20, the School of Aeronautics should provide advanced instruction as regards aeroplanes, seaplanes, airships and kite-balloons in (1) aerodynamics; (2) aero-engines and methods of propulsion; (3) design, including structure and materials; (4) instruments, meteorology, and navigation. It would follow, therefore, that certain of the professors or lecturers in each of these subjects will discharge double responsibilities, (5) as members of the staff of the Imperial College and (6) as officers of the research organisation directed by the Aeronautical Research Committee.

52. The Interim and Final Reports of Special Committee No. 5 of the Civil Aerial Transport Committee contain much valuable information as to the organisation of teaching and research. One factor of importance which they emphasise is the need for a trained staff to act as a clearing house for the co-ordination and dissemination of aeronautical knowledge in all its aspects. The Central School of Aeronautics should, in our view, serve this purpose.

The functions of the teaching staff of the school may be stated under four distinct, though closely related, purposes:

(a) To study, co-ordinate, summarise, apply and extend the knowledge derived from the experimental work carried out by the individual workers at various experimental stations in this country and abroad; (b) to stimulate research by indicating what information is most urgently required and what line of attack is likely to prove most profitable; (c) to guide and encourage research by constructive criticism based on a careful study of past and current work in this country and abroad; (d) to impart this knowledge by personal teaching to a limited number of post-graduate students.

A similar clearing house for current knowledge would be of value in any science, but for aeronautics it is, for the present, essential, for whereas in older sciences—Physics, for instance—the bulk of the experimental data have, throughout the course of generations, crystallised into well-defined laws which form a framework ready to receive any new facts and a criterion by which their accuracy can be estimated, in aeronautics the facts are the result of the work of the last five or ten years, and the framework uniting them exists only in the minds of the few men who have been personally connected with the process of development.

Before the war the total available knowledge was small, and it was possible for the members of the Advisory Committee to keep all the facts in mind

while devoting the majority of their time to other duties. They then provided the necessary co-ordinating factor. This is no longer possible, and the function could best be discharged by the staff of the school working under their Director with a view to co-ordinating and making available all the knowledge in each branch of the work as existing at the moment.

For these reasons it is essential that the permanent staff of the Central School should be adequate both in numbers and in range of experience to the duties outlined above.

53. It has been arranged that the Zaharoff Professor of Aviation should be Director of the School of Aeronautics in the Imperial College. We consider that he ought to have an important voice in the direction of research, not only in the College but at the Central Research Establishment and elsewhere. He would naturally be a member of the Aeronautical Research Committee, and in this way be brought into intimate contact with the investigations in all the stations. The work would occupy his full time. These considerations will no doubt be borne in mind by the body responsible for making the appointment.

It will also be necessary to have a full-time Professor of Aerodynamics at a salary, say, of £1,000.

54. The engineering questions relating to airships and kite-balloons are of such importance and so distinct as to require the full time of a senior officer, who would devote himself to teaching and research, and whose duty it would also be to ensure that special problems relating to these subjects were adequately dealt with in the courses of instruction on aircraft engines and strength of materials. For this purpose we recommend the appointment of a Professor of Airship Construction.

55. The subject of meteorology, including with it training in navigation and the use of instruments employed in flight, is one of great importance. The position, however, of the teacher of this subject must depend on the action taken with regard to research and inquiry into meteorological science generally. We have made provision in the estimates for a teacher in meteorological subjects closely connected with aeronautics who should combine this work with research at one of the experimental stations. His work would be brought into connection with the central meteorological establishment. We would add that quite apart from the other interests concerned we feel it our duty to press for the establishment of a properly equipped centre of teaching in this subject, the need for which has been felt for some years and is now acute.

56. Our estimate of the numbers and cost of the total establishment at present required for the Department of Aeronautics at the Imperial College is given in Appendix A.

The dual functions of research and education might perhaps be combined as shown below:—

Imperial College.	Research Organisation.
1. Professor of Aerodynamics	Aerodynamics Research, Central Research Establishment.
2. Professor or Lecturer on Engines and Methods of Propulsion.	Engine Research Laboratory, Central Research Establishment.
3. Professor or Lecturer on Design.	Design Branch of Central Research Establishment or Designer of some private firm.
4. Professor of Airship Construction.	Research Officer at a central Airship Station.

Clearly, however, the feasibility of such combinations must depend on the men available, and the above is only put forward as a possible arrangement.

57. It is obvious that this quality of functions can only be maintained on a basis of goodwill and readiness to co-operate between the Imperial College with whom will be vested the appointments in the School of Aeronautics and the Aeronautical Research Committee, but we feel that the details of the method of establishing full co-operation should be left to the two bodies to determine.

Estimated Cost of Educational and Research Organisation

58. (a) The main item will be the maintenance of the central research establishment at Farnborough. This is, we understand, provided for on an adequate scale in the estimates of the Research Directorate of the Air Ministry. Along with the above should be considered the provision for other work undertaken for the Air Ministry, such as the responsibility for the Air Inventions Committee and the Accidents Committee.

(b) Provision must continue to be made for the expenditure of the aeronautical department at the National Physical Laboratory. The provision made for 1919-20 was £33,000, and this sum falls on the votes of the Department of Scientific and Industrial Research.

(c) We estimate that the cost of the Department of Aeronautics at the Imperial College, with salaries on the standards of remuneration which obtain in existing departments of the College, together with an allowance for wages of mechanics and cost of laboratory experiments, should amount to about £10,000 a year. (See Appendix A.) Towards this sum the income of the Zaharoff endowment of £25,000 is all that is at present available.

(d) Besides the provision to be made at the Imperial College, provision should be made for research other than that required specifically for the Air Ministry. The responsibility for this lies already with the Department of Scientific and Industrial Research, who are making grants to individual research workers, amounting during the current academic year to £31,500. (See Section 38 (c) of the Report.)

A Height Record

LIEUT. CASALE on February 17 at Villacoublay beat his own altitude record for pilot and two passengers of 6,700 m. made on December 14 last. Flying a Spad-Herbemont fitted with Hispano-Suiza motor and Lumiere propeller, he got up to a height of 7,300 m. (23,725 ft.) in 46 mins., and then his barograph ceased to register.

An Italian-Grecian Aerial Mail

NEGOTIATIONS have been opened between the Italian and Grecian Governments, with a view to establishing an aerial mail between the two countries, under the regulations of the convention recently agreed upon by Italy and Greece. The Italian aerodrome will be at Brindisi and the other terminus will be at Corfu.

The Rome-Tokyo Flight

THE two S.V.A. aeroplanes, piloted by Lieuts. Ferrarin and Masiero, arrived at Salonika from the Centocelle aerodrome, near Rome, after a non-stop flight on February 18. They were reported at Smyrna the next day, and reached Adalia, in Asia Minor, on February 23.

(e) Provision may also have to be made in future for the development of teaching and research elsewhere as well as at the Imperial College. (See Section 1 (c) of the Report.)

(f) The fees of the non-official members of the Aeronautical Research Committee must also be allowed for, but this will be a minor item.

Recommendations

Our recommendations are as follows:—

I. An Aeronautical Research Committee should be constituted in connection with the Air Ministry.

II. Encouragement should be given to the establishment of an Industrial Research Association for the aeronautical industry.

III. The Aeronautical Research Committee should include representation of—

(a) The Department or departments responsible for (i) naval and military aeronautics, (ii) the regulation of civil aerial transport; (b) the Department of Scientific and Industrial Research, including direct representation of the National Physical Laboratory; (c) the aircraft industry; (d) the Imperial College; as well as (e) other members of scientific attainments.

The Chairman of the Committee should be a scientist of eminence, and in a position independent of the Government departments represented on the Committee.

IV. It should be the duty of the Aeronautical Research Committee to devote itself to the advance of aeronautical science, and, with this object, in particular:—

(1) To advise on scientific and technical problems relating to the construction and navigation of aircraft; (2) to undertake or supervise such research or experimental work as is proposed to the Committee by the Air Ministry, and to initiate any research work which the Committee considers to be advisable; to carry out such work itself or to recommend by whom the work should be carried out; (3) to take over complete responsibility for the Air Inventions Committee and for the Accidents Committee; (4) to promote education in aeronautics by co-operating with the Governors of the Imperial College; (5) to assist the aeronautical industry of the country by scientific advice and research, and to co-operate with any research association that may be established; (6) to prepare for the approval of the Air Council a scheme of work and estimate of expenditure for the year, and to administer the funds placed at its disposal by the Air Council in accordance with Recommendation VI; (7) to make reports from time to time to the Air Council.

V. The Committee should replace the present Advisory Committee for Aeronautics, and its non-official members should receive suitable remuneration.

VI. The expenditure of the Committee should form part of the Annual Vote taken by the Air Ministry, and the arrangements should be such as to allow adequate freedom to the Committee within the limits of the total sum available.

VII. It is not, in our opinion, practicable at present to establish a School of Aeronautics at more than one institution providing the specialised training required by those who are to direct aeronautical research and the design and construction of aircraft. For this purpose we recommend that a Department of Aeronautics in the Imperial College under the Directorship of the Zaharoff Professor of Aviation should be established for the provision of advanced instruction in aeronautics generally on the lines indicated in Sections 52 to 56 of our Report. The scheme for the Department should be framed with full regard to the facilities provided in existing departments of the Imperial College, and should be settled in consultation with the Aeronautical Research Committee. It should be left to the Governing Body of the Imperial College and the Aeronautical Research Committee to determine a method of mutual co-operation.

VIII. Arrangements should be made whereby, as far as possible, the officers in charge of the researches at Farnborough and elsewhere should hold positions on the teaching staff of the Department of Aeronautics.

APPENDIX A.

Estimated Cost of Teaching Staff in the Department of Aeronautics in the Imperial College, with Cost of Expenses of Laboratory Work.

Zaharoff Professor of Aviation (Director of the School of Aeronautics)	£ 1,500
Professor of Aerodynamics	1,000
Professor of Airship Construction	1,000
Five Teachers (part time) on Design, Materials, Aircraft Engines, Meteorology and Navigation, and Airships at an average remuneration of £400 each	2,000
Four Teachers (full time) at an average remuneration of £375	1,500
Provision for occasional lecturers	500
Mechanics' wages	7,500
Expenses of Laboratory Work	1,000
	£10,000

It should be noted that in respect of meteorology this estimate includes only the cost of the special teaching required in the Aeronautics Department; it does not cover the cost of establishing a centre for meteorological instruction generally.

The Caproni biplane, piloted by Lieuts. Negrini and Origgi, landed at Adalia on February 18, and subsequently went on to Smyrna.

The Caproni, piloted by Scavini and Bonalumi, was reported to have reached Delhi last week.

Swiss-German Aerial Traffic

AN agreement for regulating aerial traffic between Switzerland and Germany has been proposed by the latter, and the Swiss Government is reported to have expressed willingness to begin negotiations.

No Police Aeroplanes for Germany

THE Council of Ambassadors at Paris on February 11 considered the request of the German and Austrian Governments to obtain aeroplanes for police duties. The request was refused as contrary to the terms of the Treaties.

A German Works Destroyed

It was reported last week that the Grade Motor Works, Magdeburg, one of the leading German aeroplane factories, had been completely destroyed by fire.

THE ROYAL AIR FORCE

London Gazette, February 17

The following officers have been granted short service commns. in the ranks stated, with effect from Feb. 17 (except where otherwise stated). They will retain their seniority in the substantive rank last held by them prior to the grant of the short service commn.

In the case of officers now gazetted Flying Officer, from Pilot Officer, seniority will date from the date of *Gazette*:—

Squadron Leader.—F. A. J. B. Wiseman, O.B.E. (S.O.).

Flying Officers.—S. G. Frogley, D.S.O., D.F.C. (A.) (with effect from Sept. 12, 1919), C. E. Tidy (T.) (with effect from Dec. 2, 1919).

Flying Officers (from Pilot Officers).—R. F. Durrant, A.F.C. (T.), F. W. Taylor (T.) (with effect from Dec. 1, 1919).

It is intended that officers employed as Stores Officers or on "Q" duties shall belong to the new Stores Branch when formed. Officers appearing in this *Gazette* who are at present so employed will be transferred to this Branch on its formation, and will accept these short service commissions on that condition. They will then come on to the rates of pay of that Branch, but will meantime be permitted to draw the higher rates laid down in the new scheme for officers on the Gen. List. Any officer posted to the Stores Branch on its formation will then have the option of declining his short service commn.

The notifications appearing in the *London Gazette* of the dates indicated below, appointing the following officers to short service commns., are cancelled:—Observer Officer W. L. Rutledge, A.F.C., M.M.; Sept. 12, 1919. Flight-Lieut. T. W. Tattersall, M.B.E. (T.) Flying Officer L. F. Peaty (T.); Oct. 24, 1919. Flying Officer R. Littlejohn (Ad.); Dec. 5, 1919. Flying Officer N. W. Wale (T.); Jan. 6. Observer Officer E. J. Munson; Jan. 20.

The notification in the *Gazette* of Jan. 30 relative to Flying Officer H. C. Price (A.) is cancelled, and that in the *Gazette* of Dec. 5, 1919, appointing this officer to a short service commn, stands.

Squad-Leader M. E. A. Wright, A.F.C. (A.P. (T.)) is granted a short service commn. with effect from Aug. 1, 1919, not Dec. 5, 1919, as stated in the *Gazette* of the latter date.

Flight-Lieut. F. J. Hooper (S.O.) is granted a permanent commn. in the rank stated; Aug. 1, 1919.

Flying Officer E. E. F. Loyd (A.) resigns his permanent commn.; Feb. 18.

The following temp. appointment is made at the Air Ministry:—*Deputy Director, 1st Class*.—Air Commodore D. Le G. Pitcher, C.M.G., D.S.O.; Feb. 15.

Flying Branch.

Group Capt. I. M. Bonham-Carter, O.B.E., to be Group Capt. (A.), from Deputy Dir.; Feb. 9.

Lieut. G. G. Tomling, M.B.E., M.C., to be actg. Capt. whilst employed as Capt. (A.), from April 12, 1919, to April 30, 1919.

Lieut. G. G. Tomling, M.B.E., M.C., to be actg. Capt. whilst employed as Capt. (A.); May 1, 1919.

To be actg. Flight-Lieuts. whilst employed as Flight-Lieuts. (A.):—Flying Officer E. J. Head; Aug. 17, 1919. Pilot Officer (Hon. Flying Officer) E. C. Baines; Oct. 1, 1919. Flying Officer A. P. Ritchie; Nov. 29, 1919.

Observer Officer (Hon. Flight-Lieut.) J. F. Davison, M.C., to be actg. Flight-Lieut. whilst employed as Flight-Lieut. (O.); Oct. 1, 1919.

Flying Officers to be Flying Officers (A. and S.), from (S.O.); Feb. 8:—A. H. Goldie, H. M. Massey, M.C.

Sec. Lieuts. to be Lieuts.:—W. G. Millar; Nov. 8, 1918 (substituted for notification in the *Gazette* of May 2, 1919), H. E. Power; Mar. 12, 1919, E. W. Richardson; April 12, 1919. R. A. C. Craddock-Hartopp; April 23, 1919 (since demobilised). F. Meehan; May 30, 1919. W. J. Todd (previously shown as William Todd); June 6, 1919 (since demobilised). W. J. Hale; June 13, 1919 (since demobilised). G. Rogerson; June 20, 1919.

Pilot Officers to be Flying Officers:—H. M. Matthews; Sept. 10, 1919 (since relinquished commn.). R. F. Ralph; Sept. 30, 1919. J. B. Lynch; Dec. 10, 1919.

Pilot Officers (O.) to be Observer Officers:—M. Thorley; Aug. 7, 1919. W. G. Jones, E. Smith, T. C. Tyers; Oct. 1, 1919.

TR9/72285 Cadet N. D. H. Evans is granted a temp. commn. as Sec. Lieut. (O.); Sept. 9, 1918.

The following relinquish their temp. R.A.F. commns. on return to Army duty:—Lieut. W. E. R. Stone (Lieut., Can. F. Art.); Jan. 1, 1919. Lieut. O. Denman, D.C.M., M.M. (Lieut., E. Ont. R.); Mar. 31, 1919. Flying Officer C. W. Odell (Lieut., R. Innis. Fus.); Sept. 23, 1919. Pilot Officer W. A. B. Buscarlet (Lieut., R.G.A.); Nov. 30, 1919 (substituted for notification in the *Gazette* of Jan. 23). Flying Officer J. W. Toone (Lieut., R. Ir. R.); Feb. 4. Flight-Lieut. J. S. Windsor, M.C. (Lieut., S. Wales Bord.); Feb. 9. Flying Officer P. G. Wells, D.C.M. (Lieut., L'pool R.); Feb. 10.

Flying Officer A. C. Getley (Paymr. Midshipman, R.N.) relinquishes his temp. R.A.F. commn. on return to naval duty; Feb. 6.

The following relinquish their commns. on ceasing to be employed:—Lieut. H. Cotton (Lieut., Qeb. R.); Feb. 6, 1919. Lieut. H. A. Prosser (Lieut., Northn. R.); Feb. 6.

(Then follow the names of 47 officers who are transfd. to the Unemployed List under various dates.)

Capt. J. L. Trollope, M.C., relinquishes his commn. on account of ill-health caused by wounds, and is permitted to retain his rank; Feb. 10.

The following Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—G. L. Rodwell (contracted on active service); Feb. 9. J. B. C. Madge (caused by wounds); Feb. 11.

Lieut. E. C. Kelly resigns his commn.; Feb. 18.

Sec. Lieut. E. R. Tremlett relinquishes his commn.; Oct. 7, 1919.

Sec. Lieut. F. W. Savignac is ante-dated in his appointment as Sec. Lieut. (A.); Aug. 16, 1918.

The Christian name of Andrew Robinson is as now described, and not Andrew S. Robinson, as stated in *Gazette* of Dec. 6, 1918 (page 14,485).

The initials of A. A. Partridge are as now described, and not A. H. Partridge, as stated in *Gazette* of Aug. 27, 1918 (page 10,008).

The surname of Lieut. M. Lawson-Williams is as now described, and not as stated in *Gazette* of May 27, 1919.

The initial of Sec. Lieut. T. Rockett is as now described, and not as stated in *Gazette* of Jan. 27.

The notification in *Gazette* of Sept. 26, 1919, concerning Lieut. N. P. Edwards, is cancelled.

The notification in *Gazette* of Jan. 30, concerning Capt. S. W. Clift (R.G.A., T.F.), is cancelled.

The notification in *Gazette* of Feb. 11, 1919, concerning Lieut. G. D. Falkenberg, is cancelled.

Administrative Branch.

Squad-Leader A. R. Stanley-Clarke, M.C., to be *Squad-Leader*, from (A.); Jan. 29.

Capt. V. A. Watson, A.M., to be Capt., from (K.B.) (from April 1, 1918,

to Mar. 19, 1919), and is graded for purposes of pay and allowances as Capt. whilst employed as Capt. (from April 1, 1918, to Mar. 19, 1919).

Flight-Lieut. R. G. Home to be Flight-Lieut., from (S.O.); Feb. 8.

Lieut. (Hon. Capt.) F. W. Napper is graded for purposes of pay and allowances as Capt. whilst employed as Capt.; from May 1, 1919, to Sept. 9, 1919.

Lieut. E. A. Malcolm to be Lieut., from Unemployed List, without pay and allowances of his rank; May 20, 1919.

Sec. Lieuts. to be Lieuts.:—(Hon. Lieut.) H. D. Patterson; April 2, 1918 (substituted for notification in *Gazette* of July 29, 1919. A. Nash; Sept. 22, 1918 (since demobilised).

The following relinquish their temp. R.A.F. commns. on return to Army duty:—Flying Officer J. Watts (Lieut., R. Muns. Fus.); Jan. 3. Flying Officer H. V. Lewis (Lieut., S. Wales Bord.); Jan. 4.

Sec. Lieut. A. W. Howard relinquishes his commn. on ceasing to be employed, and is permitted to retain his rank; Nov. 3, 1919.

(Then follow the names of 11 officers who are transfd. to the Unemployed List under various dates.)

Lieut. P. T. Bond (Linc. R., T.F.), relinquishes his commn. on account of ill-health contracted on active service; Feb. 4.

The notification in the *Gazette* of May 27, 1919, concerning Lieut. C. C. Statt is cancelled.

The notification in the *Gazette* of Oct. 28, 1919, concerning Sec. Lieut. E. R. Tremlett is cancelled.

The notification in the *Gazette* of Nov. 18, 1919, concerning Sec. Lieut. A. W. Howard is cancelled.

Technical Branch.

Flight-Lieut. E. Ball to be Flight-Lieut., Grade (B), from (K.B.); Jan. 24.

Flying Officer E. J. Newman to be actg. Flight-Lieut. whilst employed as Flight-Lieut., Grade (B), without pay and allowances of that rank; Nov. 11, 1919.

Flying Officer H. R. Powell to be Flying Officer, Grade (B), from (O.); Nov. 6, 1919.

The following Sec. Lieuts. are graded for purposes of pay and allowances as Capt. whilst employed as Capt. Grade (B):—(Actg. Capt.) W. Borland, M.B.E.; from April 10, 1919, to April 30, 1919. E. P. Dampier; from May 5, 1919, to Sept. 11, 1919. Sec. Lieut. D. P. Glazer to be Lieut., without pay and allowances of that rank; April 2, 1918 (since relinquished commn.).

Pilot Officers to be Flying Officers, without pay and allowances of that rank:—B. I. Carter, S. T. Clemens, B. J. Harper, J. A. Joyce, H. Satterford, W. J. Shilcott, H. Williams; Oct. 1, 1919.

The following Lieuts. relinquish their commns. on ceasing to be employed: W. Hay (Lieut., Manitoba R.); Dec. 11, 1918. M. A. H. Fell (Lieut., N.Z. Exped. Force); Feb. 18, 1919.

Lieut. J. A. V. Welsh (Lieut., R.E.) relinquishes his commn. on ceasing to be employed, and is permitted to retain his rank; Nov. 16, 1919.

(Then follow the names of 22 officers who are transfd. to the Unemployed List under various dates.)

Capt. S. W. Clift (R.G.A., T.F.) relinquishes his commn. on account of ill-health, and is permitted to retain his rank; Jan. 19.

The notification in the *Gazette* of Nov. 25, 1919, concerning Lieut. J. A. V. Welsh is cancelled.

The notification in the *Gazette* of Nov. 28, 1919, concerning Lieut. C. J. Miln is cancelled.

The notification in the *Gazette* of Nov. 11, 1919, concerning Sec. Lieut. (Hon. Lieut.) A. S. Walker is cancelled.

Dental Branch.

N. H. Medhurst is granted a temp. commn. as Lieut.; June 17, 1918 (substituted for notification in the *Gazette* of June 21, 1918, wherein he was shown under Medical Branch).

Lieut. P. E. Bernard relinquishes his commn. on account of ill-health, and is permitted to retain his rank; Feb. 11.

Memoranda.

Group Capt. A. M. Longmore, D.S.O., is restd. to full pay; Feb. 5.

(Then follow the names of 5 Overseas Cadets who are granted temp. commns. and 6 Cadets who are granted hon. commns. as Sec. Lieuts.)

London Gazette, February 20

Flying Officer A. T. Laing (Ad.) is granted a permanent commn. in rank stated; Aug. 1, 1919.

The notification in *Gazette* of Aug. 1, 1919, appointing Lieut. D. G. A. Batterbury (A. and S.) to a permanent commn., is cancelled.

The notification in *Gazette* of Jan. 20, appointing Flight-Lieut. V. A. Watson, A.M. (S.O.) to a permanent commn., is cancelled.

Flying Branch.

Wing Comdr. C. L. Courtney, C.R.E., D.S.O., relinquishes appointment of Dep. Dir., 2nd Cl.; Feb. 15.

Flight-Lieut. R. Halley, D.F.C., is restored to full pay; Jan. 28.

Sec. Lieuts. to be Lieuts.:—(Hon. Lieuts.) H. A. Deakin; May 13, 1918 (since relinquished commn.). (Hon. Lieut.) J. D. Le Grove; May 23, 1918 (since relinquished commn.). (Hon. Lieut.) E. Hamilton; June 24, 1918 (since demobilised). G. M. Jeffrey; July 14, 1919 (since demobilised). (Hon. Capt.) L. R. Hibbert; Nov. 17, 1918 (since relinquished commn.). (Hon. Lieut.) R. W. L. Thomson; Feb. 1, 1919 (since demobilised). W. A. G. Hawker; Feb. 5, 1919 (since demobilised). R. H. Matthews; March 26, 1919 (since demobilised). R. C. Marray, D.C.M., M.M.; May 18, 1919 (since demobilised). H. B. Hewat; June 6, 1919. A. H. Bosher; June 18, 1919 (since demobilised). R. D. Butler (since demobilised), J. E. H. Littlewood (since demobilised); June 20, 1919. R. H. McSheppard; July 10, 1919 (since demobilised). Pilot Officer B. Scovell to be Flying Officer (A'ship); Oct. 1, 1919.

The following relinquish their temp. R.A.F. commns. on return to Army duty:—Lieut. J. W. McDonald (Lieut., Can. Mil.); Jan. 3, 1919. Lieut. E. N. Baillon (Lieut., B. Columbia R.); Feb. 25, 1919. Lieut. K. B. Forster, D.F.C. (Lieut., Manitoba R.); Mar. 22, 1919. Lieut. W. T. A. Burkhitt (Lieut., B. Columbia R.); Mar. 31, 1919. Flying Officer R. L. Edward (Lieut., L'pool R.); Oct. 27, 1919. Flying Officer E. R. Maddox, M.C. (Lieut., Hamps. R.); Nov. 28, 1919. Flying Officer T. M. Dickinson, D.F.C. (Capt., 16th Cav., Ind. Army); Feb. 11. Flying Officer A. S. M. Meyrick-Jones, A.F.C. (Lieut., R.G.A.); Feb. 13.

Lieut. T. B. Bruce, M.C., relinquishes his commn. on ceasing to be employed; Feb. 7.

(Then follow the names of 56 Officers who are transfd. to the Unemployed List under various dates.)

Sec. Lieut. A. K. Smithells relinquishes his commn. on account of ill-

health contracted on active service, and is permitted to retain his rank; Feb. 14.

Sec. Lieut. W. N. Jackson is ante-dated in his appointment as Sec. Lieut. (A.); May 6, 1918.

The name of Capt. W. G. R. Hinchliffe is as now described, and not as stated in the *Gazette* of Jan. 23.

The surname of Sec. Lieut. R. L. Cane is as now described, and not as stated in the *Gazette* of April 18, 1919.

The surname of Sec. Lieut. C. H. Friese-Greene is as now described, and not as stated in the *Gazette* of April 18, 1919.

The surname of Capt. F. Sharpe is as now described, and not as stated in the *Gazette* of April 4, 1919.

The surname of Sec. Lieut. G. N. Pask is as now described, and not as stated in the *Gazette* of April 8, 1919.

The surname of Flight-Lieut. V. H. Huston, M.C., is as now described, and not as stated in the *Gazette* of Jan. 23.

The Christian names of Lieut. Victor Lindeman Allan Burns are as now described, and not as stated in the *Gazette* of April 1, 1919.

The Christian names of Lieut. Leslie Albert Martin are as now described and not as stated in the *Gazette* of Feb. 4, 1919.

The notification in the *Gazette* of July 22, 1919, concerning Lieut. E. S. Noble is cancelled (notification in the *Gazette* of Sept. 23, 1919, to stand).

The notification in the *Gazette* of Dec. 2, 1919, concerning Sec. Lieut. (Hon. Lieut.) A. C. McKinnon, is cancelled.

The notification in the *Gazette* of July 8, 1919, concerning Lieut. W. R. Hudson (Manitoba R.), is cancelled.

The notification in the *Gazette* of Oct. 3, 1919, concerning Sec. Lieut. H. T. Barrett, is cancelled.

Administrative Branch.

Sec. Lieuts. to be Lieuts.:—C. E. Yates; Mar. 1, 1919 (since demobilised) (notification in the *Gazette* of June 27, 1919, to stand). J. G. le Brun; Mar. 8, 1919 (since relinquished comm.). G. W. Colebourne; May 8, 1919 (since demobilised). W. R. Fairbairn; June 3, 1919 (since granted short service comm.). H. H. Watson; June 20, 1919 (since demobilised).

Sec. Lieut. A. Ashby is graded for purposes of pay and allowances as Lieut. while employed as Lieut.; May 1, 1919.

Sec. Lieut. (Hon. Lieut.) H. D. Patterson to be Sec. Lieut. (Hon. Lieut.), from (T.); April 1, 1918.

AVIATION IN PARLIAMENT

Aeroplanes for Indian Outposts

In the House of Commons on February 16 Mr. Cairns asked the Secretary of State for War if aeroplanes were asked for by Fort Sandeman and other outposts since January, 1919, and, if so, why they were not granted; if the Government was offered aeroplanes after the armistice and when, and if and when they were accepted; and what number of aeroplanes were in India in January, June, and December, of 1919?

Mr. Montagu, who replied, said: I am unaware that any outposts asked for aeroplanes, which, I may remark, require landing grounds and aerodromes and other preparations to be made in advance. One hundred aeroplanes, were offered to the Indian Government in June, 1919, for civil purposes, and were at once accepted. No personnel was included in this offer. It was unnecessary to offer aeroplanes for military purposes, since the Government of India had already made known their requirements, and these have now been met by increasing the two squadrons of the R.A.F. which were in India in January and June, 1919, to six in December, 1919.

British Somaliland. Successful Operations Against Mullah

VISCOUNT DUNCANNON on February 17 asked the Under-Secretary of State for the Colonies if the Government had any information in regard to recent operations in Somaliland?

The Under-Secretary of State for the Colonies (Lieut.-Col. Amery): I hope that the satisfactory character of my reply will excuse its length.

Ever since the Colonial Office took over the administration of British Somaliland in 1905 the situation in the Protectorate has been one of great difficulty. From 1907 onwards hostilities by the Mullah have been continuous. Moving down from the Nogal Valley, the dervishes have raided and looted far and wide, and in 1914 even raided within musket range of Berbera itself. During the last five years their fighting policy became increasingly aggressive, and instead of limiting themselves to raiding parties on the friendly tribes, they established themselves permanently in forward posts consisting of stone forts of immense strength. Forts of this character were established at Tale, the main headquarters of the Mullah himself, at Jidali in the north-eastern part of the Protectorate among the hills overlooking the Gulf of Aden, and at Baran, east of Jidali.

To meet the dervish aggression steps were taken in 1914 to re-form and re-organise the Somaliland Camel Corps on an increased footing. This policy was completely successful so far as dealing with raiding parties was concerned, and the defeats inflicted on the dervishes at Shimbir Berris in 1914-15 resulting in the destruction of the forts there, and later at Endow and the Ok Passes, cleared dervish raiding parties once for all from the western half of the Protectorate, which henceforward remained under settled administration. The position, however, still remained most unsatisfactory and precarious owing to the fact that the dervishes (who still held more than half of British Somaliland) were firmly established in the eastern part of the Protectorate, particularly at Jidali, where their fortifications enabled them to threaten the coast and the friendly tribe of Warsangeli, who suffered severely on several occasions from dervish raids. Thus, in 1916, it was found necessary to station a detachment of Indian troops at Las Khorai, the chief town of the Warsangeli, in order to protect the tribe from constant dervish aggression from Jidali and Baran.

During the last few years it has become increasingly clear that the situation which has existed ever since the rise of the Mullah in 1901, and which has inflicted untold suffering on the inhabitants of the Protectorate, could only be cured by the definite and final break-up of his power. During the War an expedition against the Mullah was obviously impracticable, but a few months ago the whole situation was carefully reviewed, in the light of the experience gained in the War. It was decided that the operations should take the form of an attack from the air, followed up, if successful, by advanced patrols of mounted forces with infantry supports. These operations have now been carried out.

The air attack opened on January 21, when aeroplanes attacked the fort at Jidali and the Mullah's camp at Medishe, inflicting heavy casualties and damage. Subsequent bombardments on January 23 practically destroyed the camp and set it on fire, the dervishes fleeing to the hills to the north and north-west. On January 28 Jidali was occupied by the Camel Corps, which had moved up from Elafweina, the garrison having previously escaped northwards into the hills. Meanwhile, on January 24, a force of King's African Rifles from Las Khorai had occupied Baran (most of the dervish garrison being killed), and destroyed the fort. Aeroplanes co-operated throughout by reconnaissance work and by bombing the dervish forts and parties wherever found.

Information was subsequently received that on January 28, the Mullah, together with his personal following and the dervish leaders, left the hills north-west of Jidali making southwards. The Camel Corps took up the pursuit from Jidali on January 30. On January 31, aeroplanes located the Mullah's party east of Elafweina and, descending to 100 ft., bombed and machine-gunned them to good effect, scattering the party and stampeding the riding animals. Simultaneously, a tribal levy, 1,500 strong, under the command of a British officer moved eastwards up the Nogal Valley towards Tale.

On February 6 the tribal levy intercepted the Mullah's party which had been disorganised by the aerial bombardment, capturing large quantities of stock and rifles as well as the Mullah's personal effects and his office. The Mullah himself escaped into the fort at Tale. This position (which was in fact a

walled town surrounded by 13 forts) had already been bombarded and set on fire by aeroplanes on previous days. It was now surrounded by the tribal levy, and in spite of the enormous thickness of the fortifications and the walls, was captured by them on February 9. The Mullah himself, with a small party of about 70 horsemen, escaped, but the rest of the dervishes in the forts either surrendered or were captured, and large quantities of stock and arms were seized.

In the meantime the force of King's African Rifles who had occupied Baran and Naval landing parties from His Majesty's ships have been rounding up the dervish parties scattered in the hills north and north-west of Jidali and have destroyed the smaller forts established in the hills and on the coast. Here also considerable captures of rifles and of stock have been made.

The result, therefore, of the operations, which have now been concluded, is that in the course of less than three weeks the power of the dervishes in British Somaliland has been entirely destroyed and that no organised resistance remains. The Mullah himself with a few personal followers is a fugitive, having lost the whole of his force, all his stock, and all his belongings. He may succeed in escaping his pursuers in the desert, but his prestige and his power of endangering the peace and security of Somaliland are, I believe, at an end.

It is important to note that this remarkable achievement has been secured without bringing in large numbers of troops to the Protectorate, and I might add, in view of statements which have been made, without the co-operation of any Foreign Power.

A battalion of King's African Rifles borrowed from East Africa was the only military force specially despatched to Somaliland to reinforce the troops already serving there, i.e., the Somaliland Camel Corps and a detachment of an Indian Army battalion.

The fact that it was possible to secure these results with the comparatively small number of troops employed in a period of less than three weeks, with practically no casualties and with a minimum of expenditure, is due to the co-operation of a unit of the R.A.F. The moral and material effect of the aerial bombardment of the dervish positions was the vital factor in the success of the operations, without which the subsequent operations of the ground troops could hardly have been effective. For the first time, in fact, the aeroplane has been deliberately employed as the primary striking instrument, and not merely as an ancillary weapon, and the result is, I venture to think, as suggestive as it is satisfactory.

Col. Wedgwood: Can the hon. member say whether this puts a stop to any prospective co-operation between us and the Italian Government in warlike operations in East Africa, or are there any further operations contemplated?

Lieut.-Col. Amery: The general operations, involving a number of different arms, were under the conduct of the Governor of the Protectorate. The Air Force was in command of Capt. Gordon. In reply to the hon. and gallant member for Newcastle-under-Lyme (Col. Wedgwood), I am not sure that any further operations will be required unless there is a possibility of the Mullah escaping.

Germany's Zeppelins

SIR W. DAVISON on February 18 asked the Prime Minister whether the Government are now in possession of indisputable evidence that the seven Zeppelins which should have been surrendered by Germany under the Peace Treaty have been deliberately destroyed; what steps are being taken in the matter; and whether the attention of the German Government has been directed to this and other instances of the wilful destruction of German national assets, in connection with their application to the Allied Governments for a reduction in the amount of the indemnity imposed on Germany by the Peace Treaty?

Mr. Bonar Law: No information has been received by His Majesty's Government with regard to the matter referred to in the first part of the question. The second part does not, therefore, arise. As regards the last part, any action by the German Government which is likely to result in a breach of the Treaty of Versailles and which comes to our knowledge is at once brought to the notice of the Council of Ambassadors, with whom it lies to warn the German Government.

Sir W. Davison: Will the right hon. gentleman ascertain whether there is any ground for the suggestion in the Press that these Zeppelins have been destroyed?

Mr. Bonar Law: There is a Commission at Berlin, on which the Air Force is represented, to deal with this kind of case. I think we can trust to it letting us know if there is any foundation for such a statement.

Germany's Aeroplanes

LIEUT.-COL. LOWTHER on February 19 asked the Prime Minister whether the Supreme Council is satisfied that the number of war planes (if any) countenanced by the Peace Treaty has not been exceeded by Germany.

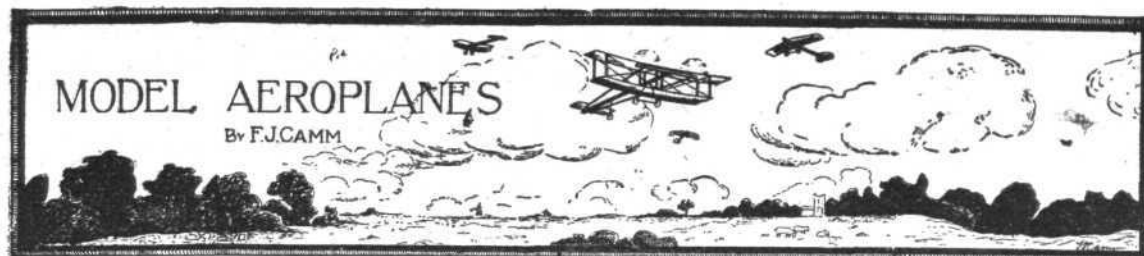
The Secretary of State for War (Mr. Churchill): Under Article 198 Germany is not allowed to retain any war planes.

Viscount Curzon: Can the right hon. gentleman define what is a war aeroplane?

Mr. Churchill: There is a complete definition, but of course an army aeroplane would be capable of being converted.

Lieut.-Col. Lowther: Are civilian aeroplanes allowed to be constructed at present in Germany?

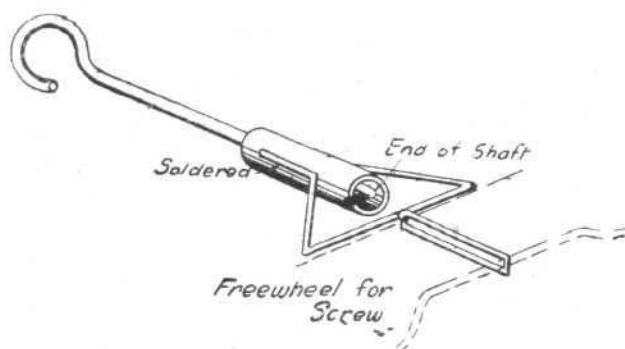
Mr. Churchill: Yes.



NOTE.—All communications should be addressed to the Model Editor.

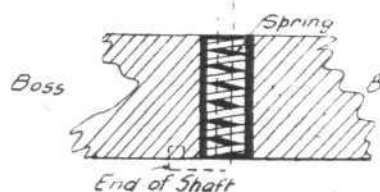
Free-Wheel Attachments for Screws

There can be no doubt that long-duration machines call for a free-wheel attachment to the screws, so that the time-length of the glide is enhanced and the gliding angle also improved. I have seen many duration models that merely come to earth in a series of phugoids once the motor is stopped, due entirely to the resistance of the stationary screws. I recently tried with satisfactory results the free-wheel arrange-



ment shown herewith, consisting of a piece of tube through which the driving-shaft passes, the end of the latter being turned back into a notch filed in the trailing edge of the tube. A piano-wire saddle carries the screw blank, the ends of which are soldered to the tube. This arrangement gave 10 secs. increase in duration. The tube should be of a bore to just suit the diameter of the shaft.

Another free-wheel arrangement, evolved by the writer, is for use on carved screws only, and is here shown. It



consists of a piece of brass tube driven into the boss, and is of a sufficient bore to take a piano-wire spring, through the centre of which the shaft may pass. The leading edge of the tube is sealed. The tension of the rubber draws the cranked end of the shaft into its seating, so driving the screw, but upon the tension of the skein being released, as soon as the torsion is exhausted, the spring forces the crank from its seating, leaving the screw free to rotate.

(To be continued.)

Making Compressed-Air Driven Model

A reader asks for the method of obtaining the proportions of a model to be driven by the compressed-air plant recently described, and also the method of treating elastic. The following reply will be of general interest:—

Assuming the weight of the complete plant to be 10 ozs., and adding a further 10 ozs. for the weight of the model itself, by loading the model at 5 ozs. per sq. ft. (a good loading to employ), gives 4 sq. ft. as the total area of the supporting surfaces. Thus the main plane could be 4 ft. 6 ins. in span and of 9 ins. chord. Hence $(4 \times 144) - (54 \times 9)$ leaves 90 sq. ins. as the area of the smaller or stabilising surface. The length of the fuselage should be from 4 ft. to 4 ft. 6 ins. The diameter of the propeller should be 13 ins., and the pitch about 21 ins., although it is difficult to specify with regard to the last two factors, so much depends on the efficiency of the engine. It is by far the best plan to weigh the thrust of the model engine. By multiplying this by our or five, the weight of the model it will lift is determined. The approximate length of flight to be obtained from a model of this type is a quarter of a mile. It cannot be said that compressed air is a more efficient motive power than elastic, but it is certainly less expensive. Moreover, it requires a deeper knowledge of the fundamental laws of flight to build and fly a compressed air model than it does

to build and fly a rubber-driven model. Apart from this, an engine-driven model is much more interesting to fly.

The Aero Models and Research Club, Late Finsbury Park District Aero Club (Secretary, Mr. Burchall, 63, Belmont Street, Kentish Town).

In the hope of giving a fillip to the sporting side of model aeronautics, this Club is organising two competitions, to be held on the Club's flying ground, Parliament Hill Fields, on Good Friday, April 1. The Club has the ambition of becoming the strongest model organisation in the kingdom, and is determined to do all in its power to further both the experimental as well as the sporting side of a most interesting and useful pastime. There are two outstanding advantages of model aeronautics which should appeal to those who are seeking a health-giving and useful hobby. In the first place, the flying of models provides a reasonable amount of exercise in the open air, as well as providing useful work for the brain in discovering why the model does certain evolutions and in endeavouring to make it do certain other manoeuvres. In the second place, there is the indoor work of model-making, calling for the exercise of patience and ingenuity, in order to get the best results from the knowledge gained in the open air. The Club hopes, therefore, that not only will members attend in strong force at the competitions on Good Friday, but that many prospective members will make a point of turning up to see what model aeroplaning is like, and lend their valuable aid to carrying on the good work.

Mr. A. E. Jones, 52, High Street, New Oxford Street, W.C. 2, is offering some prizes for an open competition with models made of materials supplied by his firm. The competitions will be held on Good Friday, April 1, at 3 p.m. sharp, and, in the event of wet weather, it will be postponed to the next day, Saturday, at the same time.

Conditions for the Open Competition.

- (1) Flying will be for tractor models.
- (2) The models must be flown on the following formula:—
Weight of rubber \times weight of model.
duration
- (3) There will be two hand-launched flights and one rising from the ground flight. (No special rising board will be provided.)
- (4) All machines must be ready five minutes before starting time.
- (5) Small repairs will be allowed, at judges' discretion.
- (6) Entrance fee 1s., payable on the ground.
- (7) The competition will not be held unless there are six entries.

Competition for Juniors under the age of 16.

- (1) Any kind of machine may be flown.
- (2) All models must be flown under the same conditions as in the open competition.
- (3) Entrance fee 6d., payable on the ground.

There will also be a competition for members only: two hand-launched flights, one R.O.G.

Prizes.

Open competition: First, parcel of materials for a 3 ft. model, including finished hollow spar and propeller; second, a pair of 12-in. propellers.

Junior competition: First, one pair of 12-in. propellers, second, one dozen yards of rubber and one tin of lubricant;

Members' competition: First, tractor monoplane, value £3, offered by Mr. Burchall.

A silver medal has been offered by Mr. Coleman for the best total of any six flights during the Easter meetings.

Mr. White will attend the meetings to take photographs.

West Kensington Enthusiasts Please Note

A West Kensington reader wishes to get into touch with any model aero clubs or enthusiasts in or near his district. Address communications to W. L. Le Page, 67, Edith Road, West Kensington, W. 14.

British Industries Fair

We are pleased to note that several of our model advertisers are exhibiting at the above Fair at the Crystal Palace. We hope to refer to the matter in greater detail in a later issue.

SIDE-WINDS

THE Anglo-American Oil Co., Ltd., announce the present retail price of their leading brands of motor spirit, as follows:—Pratt's aviation spirit, 4s. 1½d. per gallon; Pratt's "Perfection" spirit, 3s. 8½d. per gallon; Anglo's "Taxibus" spirit, 3s. 6½d. per gallon.

MESSRS. BARIMAR, LTD., scientific welding engineers, of 10, Poland Street, London, W. 1, announce the opening of the new branch of their business known as Barimar (South Africa), Ltd., with headquarters at Barsdorf's Buildings, Johannesburg. It is no secret that, from the time when Barimar, Ltd., took the initial steps necessary to the formation of a branch in South Africa, considerable interest has been manifested in all parts of the Union. The chairman of the new company is Mr. F. C. Sturrock, a capable business man associated with many large undertakings, who was until recently President of the Johannesburg Chamber of Commerce. The general manager, Mr. W. G. Coverdale-Rider, has had installed the latest welding plants, and the company has fully-equipped machine-shops, so that South African customers will be able to get fractured machine parts of every description re-created under the most scientific methods. Barimar has dispatched well-known British welding engineers, who will be responsible for the entire output of the new factory.

THE address of the Department of Scientific and Industrial Research is now 16-18, Old Queen Street, Westminster, S.W. 1. Telephone, Victoria 7940.

ALL rumours respecting Messrs. Gordon Watney and Co., Ltd., have been laid to rest by the fact that Maj. Gordon Watney has purchased the goodwill and London business of Messrs. Gordon Watney and Co., Ltd., of 31, Brook Street, Bond Street, W. 1, and has secured the services of Mr. Cyril T. Chamberlaine as general manager and director, Mr. Zillwood as works manager, and Mr. N. Penfold as chief of coachwork department.

It was announced at the recent annual meeting of Rolls-Royce, Ltd., that the company's claim against the Government which arose out of the contracts cancelled at the time of the Armistice was on the point of being settled. The rumours as to a large profit accruing from the settlement of these contracts appear to be unfounded, since the settlement is merely in respect of the company's expenditure.

Making a Scottish Aerodrome

AN action has been brought in the Scottish Courts by the Air Council against Messrs. F. C. Cowieson and Co., contractors, of Glasgow, for £49,908, alleged to be the amount which the defendants have been overpaid for work done by them in the construction of the Renfrew Aerodrome.

The amount received by the defendants was £316,808. The amount which the plaintiffs say was sufficient for the work was £266,900, and the amount sued for is the difference. Alternatively the plaintiffs sue for £60,000 damages. It is alleged that irregularities took place in the execution of the contract. In particular they say that there was wanton waste and an absence of competent supervision; that materials were ordered in excessive quantities and stored in such a manner as to cause damage from exposure, and that the labour employed was in excess of what was required. It is also stated that no proper accounts or records were preserved by the defendants.

The defendants deny all the allegations, and maintain that the work was executed as rapidly and economically as possible, having regard to the difficulties with which they had to contend and the inadequacy of the instructions given by the plaintiffs.

Lord Ormisdale sent the case to the roll for discussion as to procedure.

Seaplane v. Submarine

In the Prize Court, on February 17, before the President, Sir Henry Duke, Maj. A. T. Barker, R.A.F., told how two British seaplanes sank a German submarine. On July 29, 1917, the seaplanes 8,662 and 8,676 (Capt. Charles Leslie Young, D.S.C., since deceased, and Lieut. (now Maj.) Warren Rawson Mackenzie, R.N.A.S.) were flying over the North Sea when they sighted the U.B.20. They immediately engaged her, and the first bomb dropped fell on the stern of the submarine, which then pursued a zigzag course on the surface for eight or nine miles. Further bombs were dropped, and, before she sank, the sides of the submarine were seen to burst open. None of the crew of 20 were rescued. Mr. E. C. Trehern appeared for the Crown. The President awarded £120 for the destruction of the U.B.20.

PUBLICATIONS RECEIVED

Italy's Part in the War. By W. K. McClure. Italy: Ufficio Tecnico di Propaganda Nazionale, Corso Italia 1, Milan.

"For Those Who Have Served." The Service Handbook. Compiled by Capt. H. H. C. Baird, D.S.O. London: Office of *The Ex-Service Man*, 11, Regent Street, S.W. 1. Price 1s. net.

Report No. 46. A Study of Airplane Engine Tests. National Advisory Committee for Aeronautics, 2722, Navy Building, 17th Street, Washington, D.C., U.S.A.

The Management Problem. By Edward T. Elbourne. (The Manufacturing Problem Series). London: The Library Press, Ltd., 26, Portugal Street, W.C. Price 4s. 6d. net.

Aviation and Insurance: Notes for Underwriters. By Hugh Lewis and Capt. G. H. Lewis, D.F.C. London: Stone and Cox, 85, Fleet Street, E.C. Price 2s. 6d.

Report No. 47. Power Characteristics of Fuels for Aircraft Engines. The National Advisory Committee for Aeronautics, Washington, D.C., U.S.A.

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